ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT EIA REPORT

PROPOSED HANTAM PV SOLAR ENERGY FACILITY (PHASE 1 – 7) ON A SITE NORTH OF LOERIESFONTEIN, NORTHERN CAPE PROVINCE

DEA Ref No: 12/12/20/2049/1 to 12/12/20/2049/7

DRAFT FOR PUBLIC REVIEW

19 January 2012 to 17 February 2012

Prepared for:

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PROJECT DETAILS

DEA Reference No.	:	» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1 » Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2 » Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3 » Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4 » Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5 » Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6 » Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7
Title	:	Environmental Impact Assessment Process Draft Environmental Impact Assessment Report: Proposed Hantam PV Solar Energy Facility (Phase 1 to 7) on a site North of Loeriesfontein, Northern Cape Province
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Client	:	Solar Capital (Pty) Ltd
Report Status	:	Draft Environmental Impact Assessment Report for public review
Review Period	:	18 January 2012 to 16 February 2012

When used as a reference this report should be cited as: Savannah Environmental (2011) Draft Environmental Impact Assessment Report: Proposed Hantam PV Solar Energy Facility (Phase 1 to 7) on a site North of Loeriesfontein, Northern Cape Province.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders were invited to comment on the Draft EIA Report which was made available for public review and comment at the following locations from **19 January 2012 to 17 February 2012**:

Loeriesfontein Public Library
www.savannahsa.com

PUBLIC MEETING

In order to facilitate comments on the Draft EIA Report and provide feedback on the findings of the studies undertaken, a public feedback meeting was held during the review period for the Draft EIA Report as follows:

Date: **7 February 2012**
Time: **17:00**
Venue: **Loeriesfontein Community Hall, Rossouw Street, Loeriesfontein**

EXECUTIVE SUMMARY

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phase. The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

- Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
- Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
- Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
- Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
- Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
- Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
- Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

The proposed solar energy facilities are to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

- An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
- An onsite **substation**
- An on-site **switching station** and a new overhead distribution **power line**.
- **Support structures** to mount the photovoltaic panels.
- **Invertors** which are required to convert the electricity from direct current to alternating current.
- **Cabling** between the project components, to be laid underground where practical.
- **Access roads**
- Temporary **laydown** and **storage areas** to be shared by all phases
- **Site offices**.

A broader study area of approximately 6 764ha has been considered within which the facility is to be constructed. An average area of approximately 1 338 ha will be required for the installation of 525 MW. The actual development footprint of the proposed facility would therefore be smaller in extent (approximately 1338 ha for all seven phases, or 19.78% of the total extent of the site). Therefore, the PV panels and the associated infrastructure can be appropriately placed within the boundaries of the broader site to avoid any identified environmental sensitivities (refer to Figure 1).

The proposed PV facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 107 of 1998. In terms of Section 24(1) of NEMA, the potential impact on the environment must be considered, investigated, assessed, and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As each phase of the project will be constructed and operated by a separate Special Purpose Vehicle, separate Environmental Authorisations will be required to be obtained. As such, each phase of this project has been registered with the National DEA under following application reference numbers respectively:

- Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
- Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
- Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
- Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
- Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
- Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
- Hantam 7 PV Solar Energy, DEA ref: 12/12/20/2049/7

As these proposed phases form part of a larger solar energy facility development, a consolidated EIA process[1] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. The following key phases have been involved thus far in the EIA Process:

- *Notification Phase* - organs of state, stakeholders, and interested and affected parties (I&APs) were notified of the proposed project using adverts, site notices, background information documents, and stakeholders letters. Details of registered parties have been included within an I&AP database for the project.
- *Scoping Phase* – potential issues associated with the proposed project and environmental sensitivities (i.e. over the broader study site), as well as the extent of studies required within the EIA Phase were identified.
- *EIA Phase* – potentially significant biophysical and social impacts[2] and identified feasible alternatives put forward as parts of the project have been comprehensively assessed. Appropriate mitigation measures have been recommended as part of a draft Environmental Management Programme (EMP).

The following potentially significant environmental impacts have been identified through the EIA Phase for the **Hantam 1 - 7 PV Solar Energy Facilities:**

[1] The approach to undertake one consolidated EIA process has been accepted by DEA

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

- » Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
- » Impacts on the social environment

The positive implications of establishing a solar energy facility on the identified site include

- » The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
- » Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
- » The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
- » On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
- » The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam PV Solar Energy Facility (Phase 1 – 7)** conclude that there are **no environmental fatal flaws** that should prevent the proposed projects from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K**.

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam PV Solar Energy Facility (phase 1 to 7) can be mitigated to an acceptable level. In

terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

» All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Programme (EMP) as contained within **Appendix K** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
» Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
» Alien invasive plants should be controlled on site.
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

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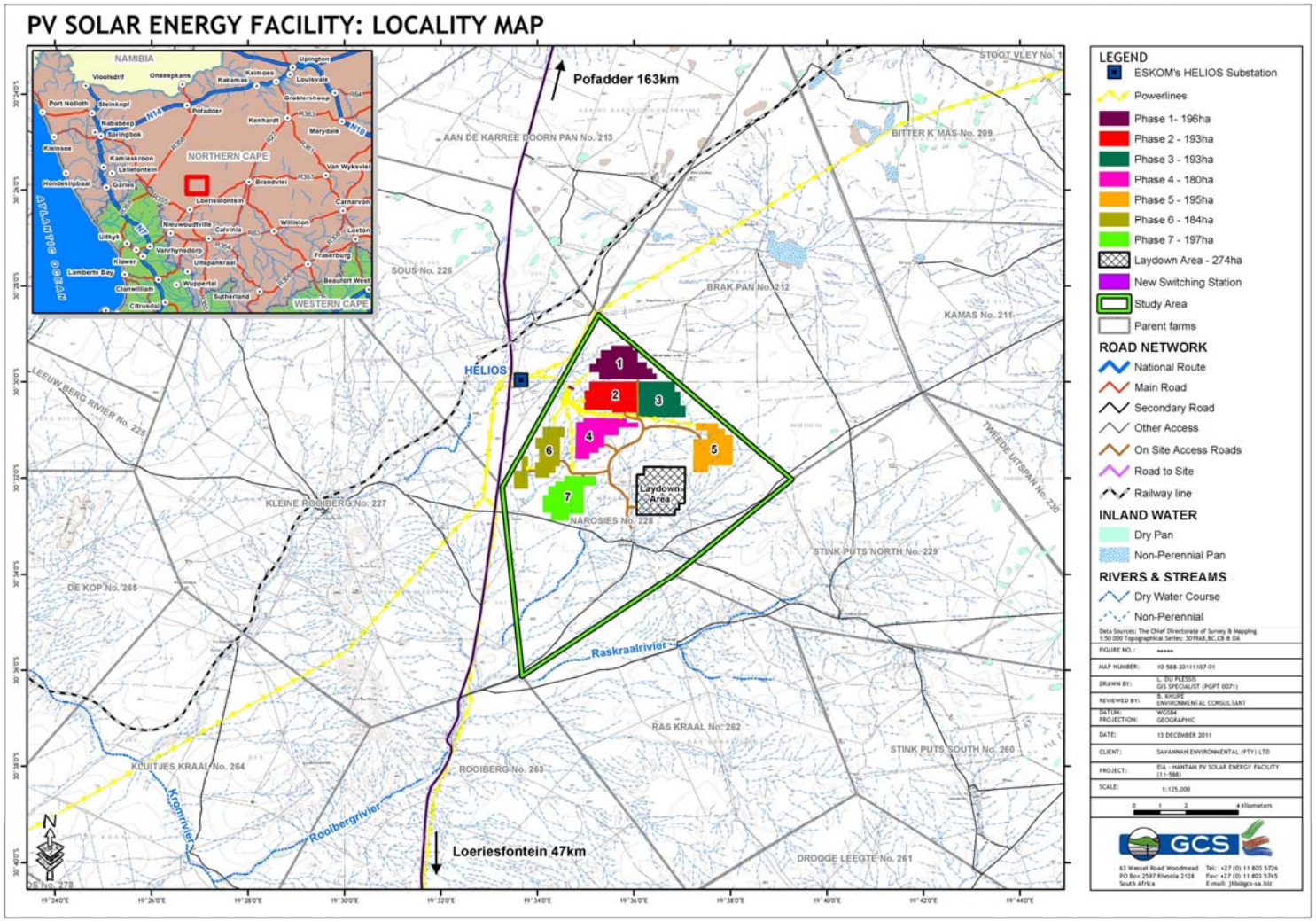

Figure 1: Locality map showing the Farm Narosies 228, the proposed site for the establishment of the solar facility, as well as the position of the 7 phases of the proposed 525MW PV solar facility

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ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
DEA	National Department of Environmental Affairs
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EPC	Engineering, Procurement and Construction
FIT	Feed-in Tariffs
GDP	Gross Domestic Profit
GG	Government Gazette
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km^2	Square kilometres
kV	Kilovolt
LUPO	Land Use Planning Ordinance, (Ordinance 15 of 1985)
MA	Million years before present
MAR	Mean Annual Rainfall
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NGO	Non-Governmental Organisation
NT	Near Threatened
NWA	National Water Act (Act No. 36 of 1998)
PV	Photovoltaic
REFIT	Renewable Energy Feed-in Tariff
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
VAC	Visual Absorption Capacity
VU	Vulnerable

DEFINITIONS AND TERMINOLOGY

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

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

Concentrating solar power: Solar generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power facilities including concentrating PV collect the incoming solar radiation and concentrate it (by focusing or combining it) onto a single point, thereby increasing the potential electricity generation capacity.

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

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

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

Early stone age: A very early period of human development dating between 300 000 and 2.6 million years ago.

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

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place.

Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

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

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

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

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

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

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

Feed-in tariffs: Feed-in Tariffs (FIT) have been set to promote socio-economic and environmentally sustainable growth. They are essentially guaranteed prices for electricity supply as opposed to conventional consumer tariffs. The basic economic principle underpinning the FIT is the establishment of a tariff that covers the cost of generation plus a "reasonable profit" to entice independent power producers to invest in generation projects.

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

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

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

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

Integrated energy plan: A plan commissioned by the DME in response to the requirements of the National Energy Policy, in order to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance between the energy demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety and environmental parameters.

Integrated strategic electricity planning: Eskom's planning process which provides strategic projections of supply-side and demand-side options to be implemented to deal with the energy management issues and meet long-term load forecasts.

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

Late stone age: In South Africa this time period represents fully modern people who were the ancestors of southern African KhoeKhoen and San groups (40 000 – 300 years ago).

Middle stone age: An early period in human history characterised by the development of early human forms into modern humans capable of abstract though process and cognition 300 000 – 40 000 years ago.

National integrated resource plan: Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies.

Optics: Concentrating PV technology typically consists of different optical elements, such as mirrors and Fresnel lenses which are used to concentrate solar radiation

onto a point where a photovoltaic cell is located. Concentrating the solar radiation serves to maximise the potential electricity generation.

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

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

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

Renewable energy feed-in tariff: Renewable Energy Feed-In Tariffs (REFITs) are used to promote renewable energy and have been adopted in over 36 countries worldwide. The establishment of the REFIT in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector, and to promote competitiveness between renewable and conventional energies in the medium and long-term. Under the National Energy Regulator Act (Act No. 40 of 2004), the Electricity Regulation Act (Act No. 4 of 2006), and all subsequent relevant amendment acts, the National Energy Regulator of South Africa (NERSA) has the mandate to determine the prices at and conditions under which electricity must be supplied by licence.

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

INTRODUCTION CHAPTER 1

Solar Capital (Pty) Ltd (Solar Capital) is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, which will be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa) the proposed development has been split into the following phases;

» **Hantam 1 PV Solar Energy Facility** (75 MW)
» **Hantam 2 PV Solar Energy Facility** (75 MW)
» **Hantam 3 PV Solar Energy Facility** (75 MW)
» **Hantam 4 PV Solar Energy Facility** (75 MW)
» **Hantam 5 PV Solar Energy Facility** (75 MW)
» **Hantam 6 PV Solar Energy Facility** (75 MW)
» **Hantam 7 PV Solar Energy Facility** (75 MW)

The nature and extent of this facility, as well as the potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this Draft Environmental Impact Assessment (EIA) Report.

1.1. Summary of the proposed Development

The facility (all seven phases) is proposed on Farm Narosies 228 which is approximately 47 km north of Loeriesfontein within the Hantam Local Municipality (SG Code C01500000000022800000) (refer to Figure 1.1). A broader study area of approximately 6764 ha is being considered within which the facility is to be constructed, although the actual development footprint of the proposed facility would be smaller in extent (approximately 1338 ha for all seven phases, or 19.78% of the total extent of the site). Therefore, the PV panels and the associated infrastructure can be appropriately placed within the boundaries of the broader site to avoid any identified environmental sensitivities.

It is proposed that the PV solar facility be developed as seven (7) phases, with each phase being developed and operated by a separate Special Purpose Vehicle (SPV) (refer to the locality map in Figure 1.1 for the location of each phase as well as the laydown area to be shared by all the phases).

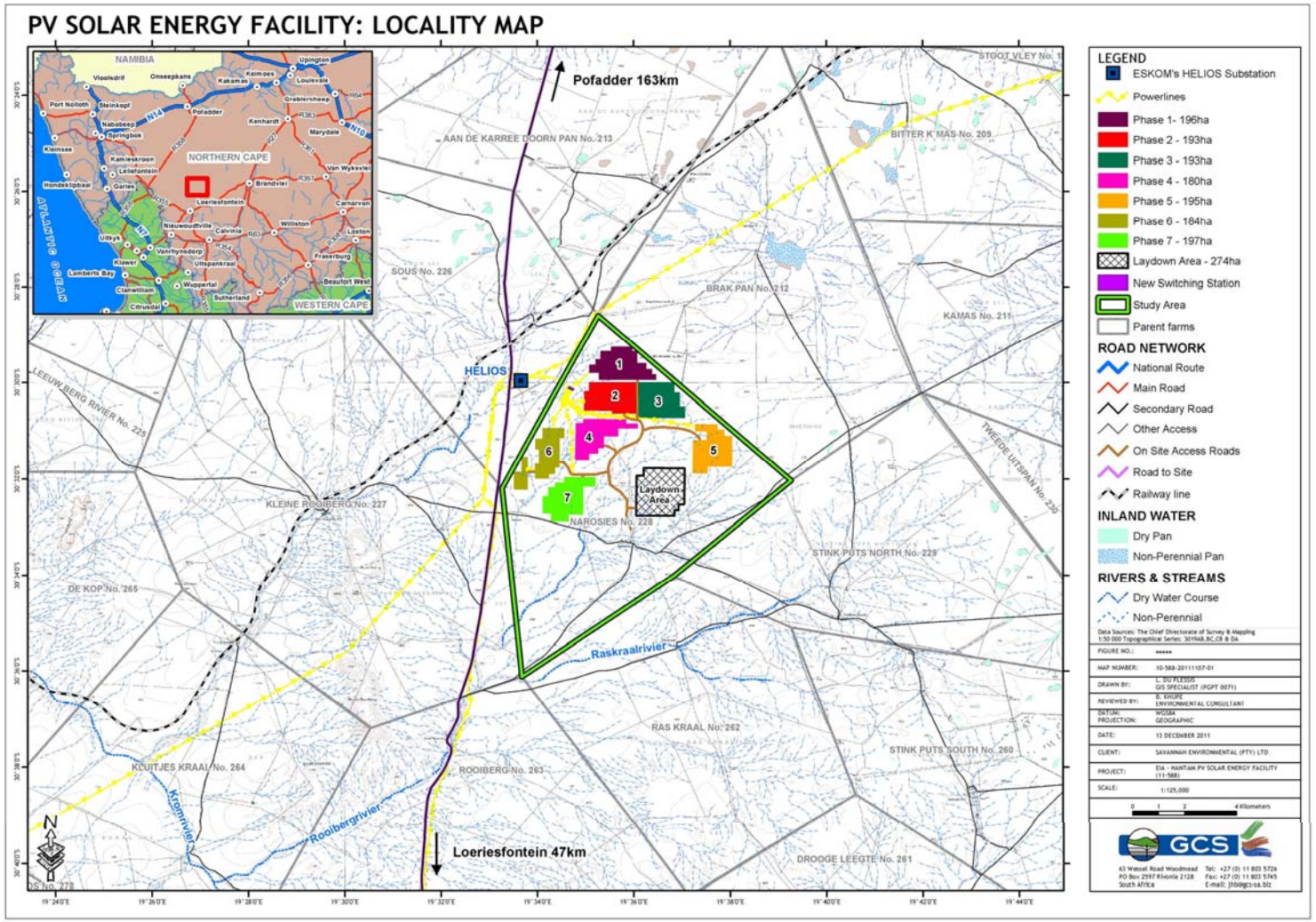

Figure 1.1: Locality map showing the Farm Narosies 228, the proposed site for the establishment of the solar facility, as well as the position of the 7 phases of the proposed 525MW PV solar facility

Infrastructure associated with **each of the seven** PV facilities will include:

» Photovoltaic solar panels with a generating capacity of up to 75 MW;
» Onsite substation and switching station as well as a new overhead distribution power line to connect to Eskom's existing Helios Substation located to the north west of the site;
» Foundations to support the PV panels;
» Cabling between the project components, to be laid underground where practical;
» Site access and internal access roads; and
» Laydown and workshop area for maintenance and storage to be shared by all the phases on the proposed development.

As the seven phases are proposed to form part of a larger solar energy facility development, a consolidated EIA process[3] is being undertaken with a single EIA report being produced to assess the potential environmental impacts associated with each phase of the development, as well as the potential cumulative impacts of all seven phases. A single public participation process is also being undertaken to consider all seven phases of the development.

The scope of the proposed solar energy facility, including details of all elements of the project (for the design/planning, construction, operation and decommissioning phases) is discussed in more detail in Chapter 2.

1.2. Conclusions from the Scoping Phase

The broader study area (i.e. the farm portions in their entirety) was evaluated within the scoping study. No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the study site were identified. In order to reduce the potential for on-site environmental impacts, it was recommended that these areas be avoided as far as reasonably possible through the facility design/micro-siting exercise. These potentially sensitive areas identified through the scoping study include:

» *Non-perennial drainage lines within the site* **-** There are a number of non-perennial drainage lines that occur on the site[4].
» *Social and visual impacts on homesteads / settlements on the site and in the broader study area* - from a social (security issues), visual (visibility of the facility), reflection of panels (glint/glare), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation

[3] The approach to undertake one consolidated EIA process has been accepted by DEA.

[4] According to the National Water Act, these are classified as wetlands or water resources.

although limited) perspective, impacts could occur on people in close proximity to the PV facility.

It was therefore recommended by the scoping study that these areas of sensitivity be avoided as far as possible and/ impacts reduced where they cannot be avoided. This has been achieved through an effective design process of the different components of the facility during the EIA Phase.

1.3. Requirement for an Environmental Impact Assessment Process

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

NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority who has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environment and Nature Conservation (NCDENC) will act as a commenting authority for the application. As each phase of the project will be constructed and operated by a separate Special Purpose Vehicle, separate Environmental Authorisations will be required to be obtained. As such, each phase of this project has been registered with the National DEA under following application reference numbers respectively:

» Hantam 1 PV Solar Energy Facility (75 MW), DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility (75 MW), DEA ref: 12/12/20/2049/2
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Compliance with the requirements of the EIA Regulations ensures that decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Solar Capital

appointed Savannah Environmental (Pty) Ltd as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA process for the proposed project.

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

Number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Description of listed activity from Regulations	Relevance of Regulation to Project
GN544[5]	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – (a) Outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275kV	Construction of a power line (outside an urban area).
GN544	11	The construction of: (iii) bridges; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line .	Potential construction of bridges / buildings within 32m of a watercourse

[5] Activities requiring a Basic Assessment

GN544	18	The infilling or depositing of any material of more than 5 cubic metres into, or dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from (i) Watercourse	Construction of access roads across drainage lines might require infilling or depositing of material.
GN545[6]	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.	The solar energy facility will consist of PV panels for electricity generation of up to 75MW per phase (a total of 525 MW for the whole facility). Invertors, substation and switching station are ancillary infrastructure for this facility.
GN545	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.	The footprint of physical alternation will exceed 20ha.

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

1.4. Objectives of the EIA Process

The Scoping Phase which was completed in December 2011 (i.e. with the acceptance of scoping in January 2012) served to identify potential impacts associated with the proposed project and to define the extent of studies required within the EIA Phase. The Scoping Phase included input from the project proponent, specialists with experience in the study area and in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

The EIA Phase (i.e. the current phase) addresses identified environmental impacts (direct, indirect, and cumulative as well as positive and negative) associated with the different project development phases (i.e. design, construction, operation, and

[6] Activities requiring a Scoping and EIA Study

decommissioning). The EIA Phase also recommends appropriate mitigation measures for potentially significant environmental impacts. The release of a draft EIA Report provides stakeholders with an opportunity to verify that issues they have raised through the EIA Process have been captured and adequately considered. The final EIA Report will incorporate all issues and responses raised during the public review phase prior to submission to DEA.

1.5. Details of the Environmental Assessment Practitioner

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

Savannah Environmental is a specialist environmental consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures. The proposed project team members include:

» *Karen Jodas* - a registered Professional Natural Scientist and holds a Master of Science degree. She has 14 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

» *Bongani Darryl Khupe* – the principle author of this report is a registered Professional Natural Scientist who holds a Bachelor of Science Honours degree and has more than 5 years experience in the environmental field. His key focus is on environmental impact assessments, environmental permitting, public

participation, environmental management plans and programmes, strategic environmental advice, rehabilitation advice and monitoring, environmental compliance advice & monitoring as well as providing technical input for projects in the environmental management field. He is currently the responsible EAP for several renewable energy projects and other EIAs across the country.

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation projects through their involvement in related EIA Processes. Savannah Environmental has completed the EIA process for the following solar facility projects:

» EIA and EMP for the proposed Kathu Solar Energy Facility, Northern Cape (EIA complete)
» EIA and EMP for the proposed Sishen Solar Energy Facility, Northern Cape (EIA complete)
» BA and EMP for the proposed Photovoltaic Installation at the OR Tambo Airport, Gauteng Province (BA process complete)
» BA and EMP for the proposed Photovoltaic Installation at the Kimberley Airport, Northern Cape (BA process complete)
» BA and EMP for the proposed Photovoltaic Installation at the Upington Airport, Northern Cape (BA process complete)
» BA and EMP for the proposed Photovoltaic Installation at the Bloemfontein Airport, Free State Province (BA complete)
» EIA and EMP for the proposed Khi CSP Solar Thermal Plant near Upington, Northern Cape Province (environmental authorisation received from DEA)
» The proposed KaXu CSP Solar Thermal Plant near Pofadder, Northern Cape Province (environmental authorisation received from DEA).
» The proposed Energy PV Plant near Vaalwater, Limpopo Province (environmental authorisation received from DEA).
» EIA and EMP for the proposed Ilanga Solar Thermal Power Plant, Northern Cape (environmental authorisation received from DEA).
» BA and EMP for the proposed Kabi Kimberley PV Solar Energy Facility, Northern Cape (environmental authorisation received from DEA).
» BA and EMP for the proposed RustMo1 Photovoltaic Plant, North West Province (environmental authorisation received from DEA).
» BA and EMP for the proposed RustMo2 Photovoltaic Plant, North West Province (environmental authorisation received from DEA).

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

OVERVIEW OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the proposed Hantam PV solar energy facility. The project scope includes the planning/design; construction; operation and decommissioning phases during which potential impacts will vary in terms of their nature and significance. This chapter also explores the "Do-Nothing" alternative - that is the alternative of not establishing the facility.

2.1. Description of the Proposed Solar Energy Facility

The solar energy facility is proposed to accommodate an array of **photovoltaic** (PV) panels with a generating capacity of up to **525 MW**, which will be developed in phases under seven separate Special Purpose Vehicles (SPVs). A broader study area of approximately 6 764ha has been considered within which the facility is to be constructed. An average area of approximately 1 338 ha will be required for the installation of 525 MW. The actual development footprint of the proposed facility would therefore be smaller in extent (approximately 1338 ha for all seven phases, or 19.78% of the total extent of the site). Therefore, the PV panels and the associated infrastructure can be appropriately placed within the boundaries of the broader site to avoid any identified environmental sensitivities.

It is proposed that the PV solar facility be developed as seven (7) phases, with each phase being developed and operated by a separate Special Purpose Vehicle (SPV) (see figure 2.1 for the position of each phase). The details of each proposed facility are summarised in the table 2.1 below.

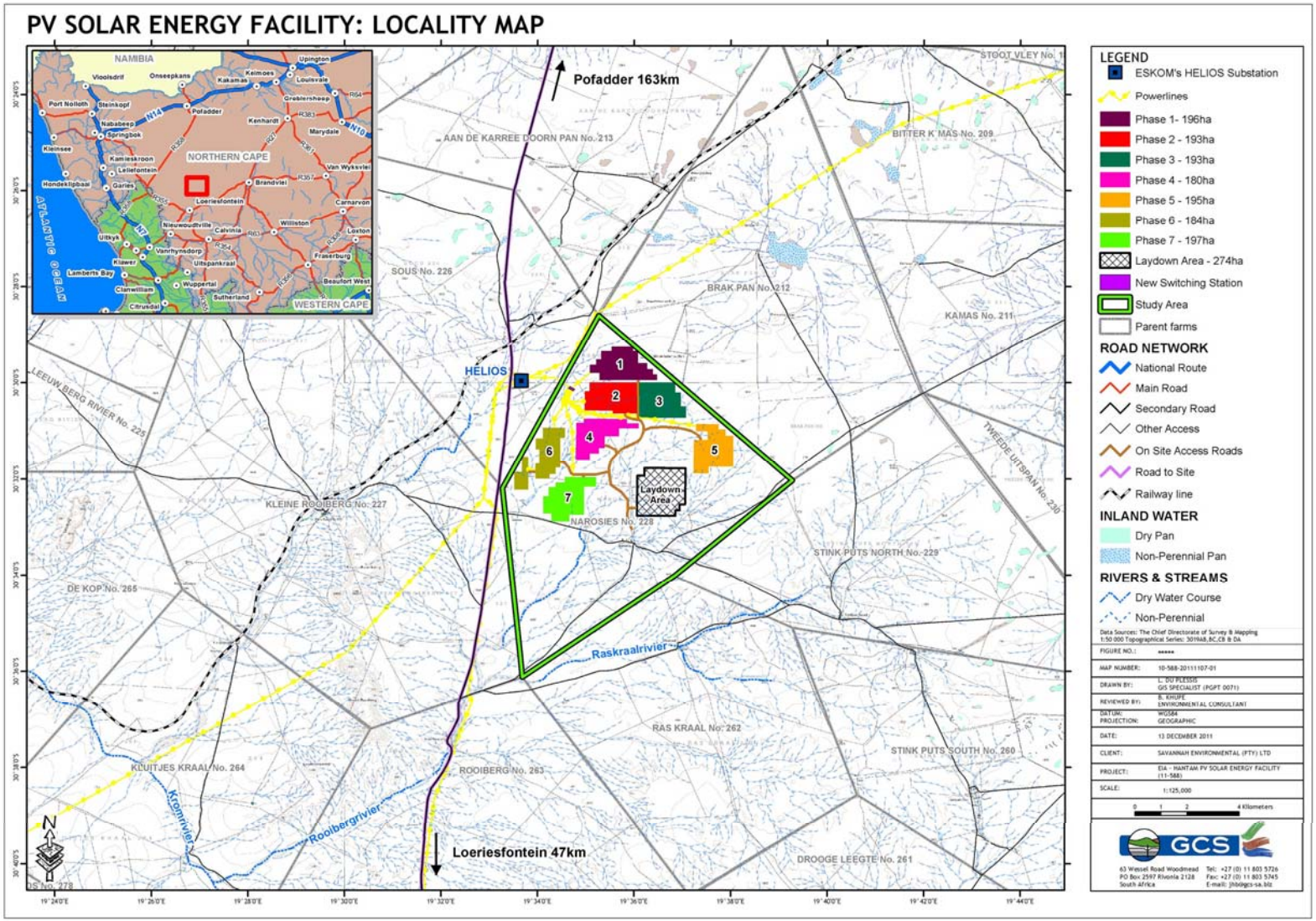

Figure 2.1: Preliminary layout for the proposed Hantam PV Solar Energy Facility

Table 2.1: Proposed Seven Phases of the Hantam PV Solar Energy

Phase name	*DEA Reference*	*Extent and farm name*	*Relevant SPV and contact details*	*Infrastructure necessary for each phase*
Hantam 1 PV Solar Energy Facility	12/12/20/2049/1	Area of approx 196 ha on Farm Narosies 228	Solar Capital Loeriesfontein (Pty) Ltd **Contact Person**: Mercia Grimbeek **Postal address** : PO Box 1199, Green Point, Cape Town, 8051 **Tel:** 021 430 0796 **Fax:** 021 430-0795 **Email**: mercia@solarcapital.co.za	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**. » **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 825 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately 6900 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.
Hantam 2 PV Solar Energy Facility	12/12/20/2049/2	Area of approx 193 Ha on Farm Narosies 228	Solar Capital Green (Pty) Ltd **Contact Person:** Mercia Grimbeek **Postal address** : PO Box 1199, Green Point, Cape Town, 8051	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**. » **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 972 m)

			Tel: 021 430 0796 **Fax:** 021 430-0795 **Email**: mercia@solarcapital.co.za	from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately 5919 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.
Hantam 3 PV Solar Energy Facility	12/12/20/2049/3	Area of approx 193 ha on Farm Narosies 228	Solar Capital Orange (Pty) Ltd **Contact Person**: Mercia Grimbeek **Postal address** : PO Box 1199, Green Point, Cape Town, 8051 **Tel:** 021 430 0796 **Fax:** 021 430-0795 **Email**: mercia@solarcapital.co.za	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**. » **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 2961 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately 5919 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.
Hantam 4 PV Solar Energy	12/12/20/2049/4	Area of approx	Solar Capital Blue (Pty) Ltd	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.

Facility		180 ha on Farm Narosies 228	**Contact Person**: Mercia Grimbeek **Postal address** : PO Box 1199, Green Point, Cape Town, 8051 **Tel:** 021 430 0796 **Fax:** 021 430-0795 **Email**: mercia@solarcapital.co.za	» **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 1449 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately 4124 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.
Hantam 5 PV Solar Energy Facility	12/12/20/2049/5	Area of approx 195 ha on Farm Narosies 228 on Farm Narosies 228	Solar Capital Brown (Pty) Ltd **Contact Person**: Mercia Grimbeek **Postal address** : PO Box 1199, Green Point, Cape Town, 8051 **Tel:** 021 430 0796 **Fax:** 021 430-0795	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**. » **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 4993 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately

			Email: mercia@solarcapital.co.za	7001 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.
Hantam 6 PV Solar Energy Facility	12/12/20/2049/6	Area of approx 184 ha on Farm Narosies 228	Solar Capital Red (Pty) Ltd **Contact Person**: Mercia Grimbeek **Postal address** : PO Box 1199, Green Point, Cape Town, 8051 **Tel:** 021 430 0796 **Fax:** 021 430-0795 **Email**: mercia@solarcapital.co.za	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**. » **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 1971 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately 4926 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.
Hantam 7 PV Solar Energy Facility	12/12/20/2049/7	Area of approx 197 ha on Farm Narosies 228	Solar Capital Gold (Pty) Ltd **Contact Person**: Mercia Grimbeek	» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**. » **Support structures** to mount the photovoltaic panels. » **Invertors** which are required to convert the electricity from direct current to alternating current. » **Cabling** between the project components, to be laid underground

			Postal address : PO Box 1199, Green Point, Cape Town, 8051 **Tel:** 021 430 0796 **Fax:** 021 430-0795 **Email**: mercia@solarcapital.co.za	where practical. » An **onsite substation** » A new overhead distribution **power line** (approximately 3522 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line. » **Access roads** with a width of less than 5 m and approximately 3730 m long within the site (for the purposes of construction and limited maintenance during operation). » Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

2.2. Solar Energy as a Power Generation Technology

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

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

2.3.1 How do Grid Connected Photovoltaic Facilities Function?

Photovoltaic facilities generate electricity through the use of photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells which absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the **"photovoltaic effect"**. The individual photovoltaic cells are commonly constructed from silicon, are linked together and placed behind a protective glass sheet to operate in unison as a photovoltaic panel.

Figure 2.2: Photograph illustrating photovoltaic panels

In order to produce 525 MW of power, the proposed plant will require numerous panels arranged in multiples/arrays which will be fixed to a support structure. In order to maximise the amount of electricity generated the panels need to be angled in such a fashion so to receive the maximum amount of solar radiation throughout the year. The preferred angle of the panels (which is dependent on the latitude of the proposed facility) may be adjusted to optimise for summer or winter solar radiation characteristics. Lastly, an **inverter** will be used to convert the electricity, which is produced as direct current, into alternating current.

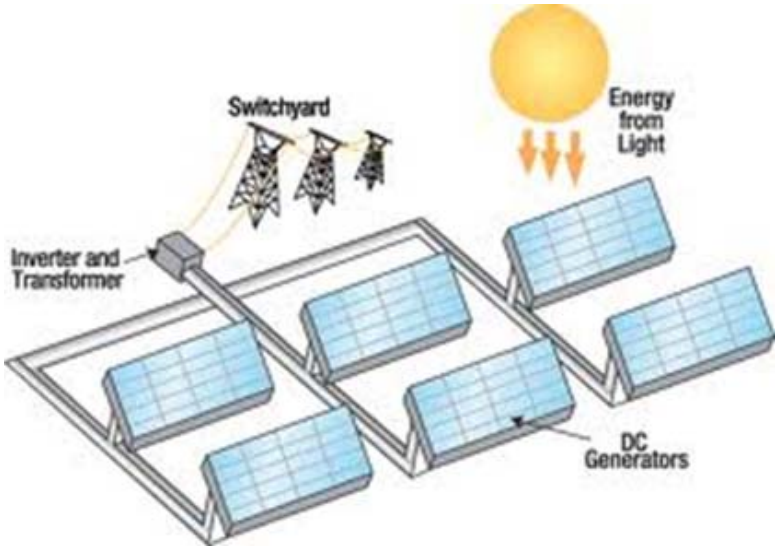

Figure 2.3: Schematic diagram of a PV plant (Sourced from: http://www.solar-green-wind.com/archives/tag/solar-cells)

2.3. Rationale for developing a PV Solar Energy Facility

The primary rationale for the proposed Hantam PV Solar Energy Facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of a 42% share of all new installed generating capacity (new build) being derived from renewable energy forms, as targeted by the Department of Energy (DoE) (Integrated Resource Plan 2010 – 2030). In terms of the Integrated Resource Plan (IRP), approximately 8.4% of the renewable energy mix is planned to be generated from PV technologies over the next thirty years. This is, however, dependent on the assumed learning rates and associated cost reductions for renewable options.

In the event of the project being developed, it will contribute to the local electricity grid, as well as to the target for renewable energy as detailed in the IRP. In addition, the implementation of the proposed project will provide both economic stimulus to the local economy through the construction process and employment for the operational phase of the facility.

In addition, the project location was specifically chosen for the construction of a large-scale PV facility (Hantam Phases 1 to 7) for the following reasons:

» Close proximity to the Eskom Transmission Helios Substation located adjacent to the western border of the site. Therefore, only a short powerline is required to connect to the substation from any one of the proposed phases.
» A study of available radiation shows that the proposed site is uniformly irradiated by the sun, hence has the required solar resource.
» The site is relatively flat as preferred for the installation of PV panels, and requires minimal earthworks.
» The site is readily accessible from the AP 2972 secondary road from Loeriesfontein.

2.4. Project Alternatives

In accordance with the requirements of the EIA Regulations[7], alternatives are required to be considered within the EIA process, and may refer to any of the following:

» Site alternatives
» Activity alternatives
» Design or layout alternatives
» Technology alternatives
» Operating alternatives
» No-go alternative

2.4.1. Site Alternatives

No site alternatives are proposed for this project as the placement of a solar facility is strongly dependent on several factors including climatic conditions, relief and orography, grid connection, the extent of the site, as well as access to the site. This site has been identified by Solar Capital through extensive pre-feasibility investigations as being highly desirable for the establishment of a photovoltaic plant. Various other locations in the greater Karoo and Northern Cape district were considered, however, this site was found to be favourable as per the following technical, logistical and environmental characteristics.

» **Climatic conditions**: The economic viability of a photovoltaic plant is directly dependent on the annual direct solar irradiation values. The Northern Cape

[7] GNR543 27(e) calls for the applicant to identify feasible and reasonable alternatives for the proposed activity.

receives the highest average daily direct normal irradiation in South Africa, which indicates that the region location of the project appropriate for solar energy facility. A study of available radiation shows that the proposed site is uniformly irradiated by the sun.

» **Topography**: A level surface area is preferred for the installation of PV panels. This reduces the need for extensive earthworks associated with the levelling of a site, thereby minimising environmental impacts. The topography of the area proposed for the PV facility is relatively flat.

» **Extent of site:** Space can be a restraining factor for the development of large-scale PV installations; for example approximately 1 338 ha will be required for a 525 MW facility. The proposed site is approximately 6764 ha in extent, which will be more than sufficient for the installation of the plant as well as its associated infrastructure within the boundary of the broader site. The seven phases of the site would only use 19.78% of the site.

» **Power transmission considerations:** Eskom's Helios Substation is less than 2 km from the western boundary of the site. Therefore, short overhead power lines will be needed to connect directly in to the substation. It has been determined through preliminary discussions with Eskom that this substation has capacity to receive the power from the proposed facility.

» **Environmentally suitable:** The site falls within a vegetation type categorised as 'least threatened' according to Mucina et al., 2006 (this has been confirmed through the ecological specialist study).

» **Site accessibility**: The site can be accessed directly from the AP 2972 secondary road from Loeriesfontein. The site lies approximately 47 km north of Loeriesfontein. The site is therefore appropriately located for easy transport of components and equipment.

» **Location of the site:** The site is located in a remote/rural area of the Northern Cape and therefore very few negative social impacts are anticipated.

Based on these considerations, Solar Capital considers the proposed site as being highly suitable for the development of the Hantam PV Solar Energy Facility. No alternative sites are considered further in the EIA process

2.4.2. Activity Alternatives

No activity alternatives were assessed because the site has been identified by Solar Capital as being highly desirable for the establishment of a photovoltaic plant and not any other development or renewable technologies such as wind or concentrated solar power (CSP).

» Wind energy installations were not considered as a feasible and reasonable alternative as the proposed developmental area does not have the required wind resource.

» CSP installations were not considered as a feasible and reasonable alternative as they require a large amount of water for cooling, unlike PV where water is only required for cleaning purposes (considering the fact that the site is in an arid area.). PV is also relatively easier to construct as opposed to CSP.

Therefore, a PV facility is considered by Solar Capital to be the only feasible activity for the proposed site.

2.4.3. Design or Layout Alternatives

This alternative was not assessed in the EIA Phase, however technical, social and environmental issues were considered, prior to the layout design/micro-siting exercise. The rationale for not considering alternatives in this category is explained below.

» *PV panels positioning* – space is a restricting factor on site considering the proposed generating capacity of the facility. In order to meet the proposed generating capacity within the proposed development area and maximise all available space after considering environmental, technical and social issues as identified in the Scoping phase, most of the available space will be utilised for the PV facility.
» *Site access* - the study site is accessible via an existing access point off the AP 2972 secondary road from Loeriesfontein. In order to reduce the environmental impact from construction of new internal access roads, part of the proposed access road will use a portion of the existing access road (access road currently being used by the landowner to access his property). That portion of the access road (approximately 4857 m) is to be used by all the phases of the proposed development. Therefore, no other feasible or reasonable alternative access was available for consideration for access to the site.
» *Site office and laydown areas* – the site offices and laydown areas for all phases will be located within the broader area proposed for development. The site offices and laydown areas have been located in such a way that they are easily accessible from all phases on the development. The laydown area and site office is to be shared by all phases of the proposed development in order to reduce the overall development footprint. Therefore, no reasonable or feasible alternative was identified by Solar Capital in this regard.

2.4.4. Technology Alternatives

Very few technological options exist in as far as PV technologies are concerned; those that are available are usually differentiated by weather and temperature conditions that prevail – so that optimality is obtained by the final selection. The PV technological options available include monocrystline, polycrystalline and thin

film modules. The impacts of any of the PV technology choices are the same. Therefore, the choice of technology does not affect the environmental impact of the proposed development. The construction, operation and decommissioning of the facility will also be the same irrespective of the technology chosen. Therefore, no alternatives were assessed in this regard.

2.4.5. Operating Alternatives

No operational alternatives were assessed as no feasible and reasonable operational alternatives were identified.

2.4.6. No-go Alternative

The 'Do-Nothing' alternative is the option of not constructing the proposed Hantam PV Solar Energy Facility. This alternative would result in no environmental impacts on the site or surrounding area. However, should this alternative be selected then the socio-economic and environmental benefits of this renewable energy facility will not be realised. These benefits are explored in further detail in the South Africa REFIT Regulatory Guideline published by NERSA (March 2009), and include:

- **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
- **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations; this translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.
- **Exploitation of our significant renewable energy resource:** At present, valuable national resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.
- **Pollution reduction:** The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation.
- **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner

and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for ~1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

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

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

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

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

2.5. Proposed Activities during the Project Development Stages

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

2.5.1. Construction Phase

The construction phase is expected to extend over a period of 12 months per phase (i.e. for the construction of a 75 MW plant) and will collectively create approximately 800 employment opportunities at the peak of construction. It is anticipated that approximately 80% of the employment opportunities will be available to low skilled (construction labourers, security staff etc.), 10% to semi-skilled workers (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The low skilled personnel are likely to be sourced from the nearby town of Loeriesfontein and it is currently proposed they would commute from their homes on a daily basis. Therefore any overnight on-site employees would be limited to security and skilled construction staff. Workers not living in the area, including those for skilled positions, will not be housed on site.

The construction phase will entail a series of activities including:

Conduct Surveys

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

A power line servitude survey will also be conducted for the proposed power lines to connect to the Helios Substation once the placement of the towers for the power line has been finalised, a walk through survey will be undertaken for ecological, archaeology and heritage resources which may necessitate certain towers to be moved to avoid on-the-ground sensitivities.

Establishment of Access Roads

The identified farm portion for the proposed facility can be accessed via the AP 2972 secondary road from Loeriesfontein. It is not envisaged that any new access roads will be required to be constructed in order to access the site. However, internal access roads will be required to access the individual components within the facility during construction and operation. The main internal access road will use a portion of the existing access road and will require construction of a new section to link the existing section with the facility. Where necessary, it may be required, in some areas, to upgrade the existing section of the road in order to suite bigger vehicle movement requirements. The extent of earthworks and compaction required in the upgrade or construction of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase.

Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each support structure. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. Where the terrain is undulating, then the ground may have to levelled to one slope. Rocks may also be removed as well as trees that may be obstacles. No protected trees were found on site.

Transport of Components and Construction Equipment to Site

The components for the proposed facility will be transported to site, in sections, by road. Some of the substation and switching station components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[8] by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation, switching station and power line.

Figure 2.4: An example of site preparation activities that required the levelling some sections of the site.

Establishment of Construction Equipment Camps

Once the required equipment has been transported to site, a dedicated construction equipment camp will need to be established within the development footprint. The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the project. The laydown area will be used for assembly purposes and the general placement/storage of construction equipment (refer to Figure 2.1). The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility so to prevent the possibility of leakages and soil contamination.

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

Establishment of the PV Panels

The PV panels will be constructed in individual 'strings' each with its own dedicated inverter. The rationale behind this layout is that if one 'string' should require maintenance or should it break down, then the generation capabilities of the whole facility will not be compromised. Each 'string' will be sited a certain distance away from each other so as to prevent shadows falling in an easterly direction from shading adjacent panels.

The PV panels will be mounted via steel structures which will be attached to uprights which are stabilised by concrete foundations where necessary. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 m -2 m from ground level.

The panel foundation holes will be mechanically excavated to a depth of approximately 200 cm. The concrete foundations where necessary will be poured and then be left for up to a week to cure. Aggregate and cement to be transported from the closest centre to the development. The installation of the underground cables will require the excavation of trenches of approximately 40 cm – 100 cm deep within which they can then be laid.

Figure 2.5: Example of erected steel mounting structures awaiting the installation of the PV panels (SunEdison Photovoltaic Power Plant, Rovigo, Italy)

Figure 2.6: Trenching for underground cables for the PV panels

Establishment of Ancillary Infrastructure

Ancillary infrastructure per phase includes invertors, power line to connect to the Helios Substation on the western border of the site, and a temporary contractor's equipment camp.

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required (refer to Figure 2.1).

Construct on-site substation and switching station

An on-site substation (per phase) and switching station of approximately 100 x 100 m each and will be required to be established on the site within the development footprint. All phases of the proposed development are to connect to this switching station. The construction of the substation and switching station would include the construction of the foundations, erection and installation of equipment (including the transformer) and connection of the necessary conductors.

Undertake Site Remediation

As construction is completed in an area, and as all construction equipment is removed from the site, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.

2.5.2. Operational Phase

The electricity that is generated from the PV panels will be stepped up through the on-site inverters and transformers at the on-site substation. Thereafter the power will be evacuated from the onsite substation via the switching station to the existing Eskom Helios Substation to feed into the national grid.

The proposed operational phase is expected to run for a period of approximately 30 - 50 years with plant maintenance. It is anticipated that during this time fulltime security, maintenance, supervision and monitoring teams will be required on site. Maintenance activities will include *inter alia*, replacement and cleaning of the panels (using pressurised air). The photovoltaic plant will be operational during daylight hours only. However, it will not be operational under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed.

2.5.3. Decommissioning Phase

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

Site Preparation

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

Disassemble and Replace Existing Components

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

REGULATORY AND LEGAL CONTEXT CHAPTER 3

3.1 Policy and Planning Context

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

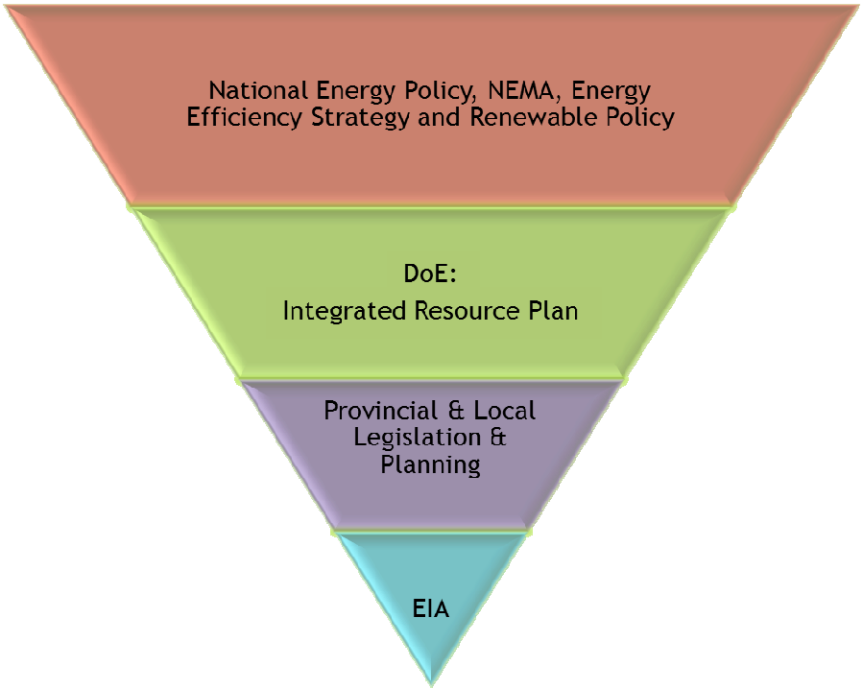

Figure 3.1: Hierarchy of electricity policy and planning documents

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

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

As such, investment in renewable energy initiatives is supported, based on an understanding that renewable energy sources have significant medium - long-term

commercial potential and can increasingly contribute towards a long-term sustainable energy future.

3.1.2 Renewable Energy Policy in South Africa, 1998

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. Government policy on renewable energy is therefore concerned with meeting economic, technical and other constraints on the development of the renewable industry.

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

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet. Solar energy is a clean, renewable resource and should be developed in South Africa on the basis of national policy as well as provincial and regional guidelines."*

3.1.3 Final Integrated Resource Plan, 2010 - 2030

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

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

» Ascertain South Africa's capacity investment needs for the medium term business planning environment;
» Consider environmental and other externality impacts and the effect of renewable energy technologies;
» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

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

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

3.1.4 Electricity Regulation Act, 2006

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently published a request for qualification and proposals for new generation capacity under the IPP procurement programme, and is in the process of updating and developing its process in relation to the awarding of electricity generation licences.

3.2. Regulatory Hierarchy for Energy Generation Projects

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels.

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

» *Department of Energy (DoE):* This department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity). Solar energy is considered under the White Paper for Renewable Energy (2003) and the Department undertakes research in this regard. It is the controlling authority in terms of the Electricity Regulation Act (Act No 4 of 2006). In order to initiate the renewable energy procurement process, the department has released the South African Renewable Energy Independent Power Producers Request for Proposals.
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for wind energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this application for authorisation, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provide legislative protection for listed or proclaimed heritage sites.
» *Department of Transport – South African Civil Aviation Authority (SACAA):* This Department is responsible for aircraft movements, controlled airspace and radar.
» *South African National Roads Agency Limited (SANRAL):* This body is responsible for all National road routes.
» *Department of Agriculture, Forestry and Fisheries (DAFF):* This Department is responsible for agriculture, forestry and fishery matters. In order, to protect agricultural resources, reports detailing agricultural potential of proposed areas for development are to be submitted to the Department for comment. DAFF supports a zero-loss of irrigated agricultural land policy.
» *Department of Water Affairs (DWA).* This Department will be involved should water resources be required or if any activities in terms of S21 of the National Water Act are triggered (i.e. the crossing of drainage lines and water abstraction for use in the facility).

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

» *Northern Cape Department of Environment and Nature Conservation (NCDENC).* This Department is the commenting authority for this application for authorisation, and will provide comment to DEA regarding the EIA reporting.

» *Department of Transport and Public Works - Northern Cape Province.* This Department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Northern Cape Department of Agriculture, Land Reform & Rural Development.* This Department's involvement relates specifically to sustainable management of the agricultural resources in the Northern Cape.
» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority).* This Department responsible for the protection of heritage resources within the Northern Cape Province.

At the **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment. The municipalities are:

» Hantam Local Municipality
» Namakwa District Municipality

In terms of the Municipal Systems Act (Act No. 32 of 2000) it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control. Hantam Local Municipality and Namakwa District Municipality's IDPs for 2010/2011 have been used to inform the assessment of social/land use impacts within the EIA process.

3.3 Relevant Legislation and Guidelines

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

» National Environmental Management Act (Act No. 107 of 1998)
» EIA Regulations (GN R543) and associated Listed activities (GN R544, GN R545 and GN R546), published under Chapter 5 of the NEMA in Government Gazette 33306 of 18 June 2010
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  * Public Participation in the EIA Process (DEA, 2010)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (2007)

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

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

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

	project holistically, and to consider the cumulative effect of a variety of impacts.		
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs Department of Environment and Nature Conservation Local Authorities	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required). Consumptive water uses may include the taking of water from a water resource - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or	Department of Water Affairs Provincial Department of Water Affairs	Compressed air will be used to clean the panels. Water for use in the operations centre will be sourced from a borehole. This water use will need to be registered (water use as defined in terms of S21 of the NWA).

	characteristics of a watercourse - Section 21i.		
National Water Act (Act No 36 of 1998)	In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	Department of Water Affairs Provincial Department of Water Affairs	This section of the Act will apply with respect to the potential impact on drainage lines, primarily during the construction phase (i.e. pollution from construction vehicles).
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.
Atmospheric Pollution Prevention Act (Act No 45 of 1965)	In terms of S27, the Minister may declare certain areas dust control areas. Part V of Act regulates pollution generated by vehicle fumes.	Department of Environmental Affairs	The project study area has not been declared a dust control area. Although there is no legal obligation relating to the activities to be undertaken best practice measures should be used to prevent dust generation from the roads and excavations during construction.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	S18, S19, and S20 of the Act allow certain areas to be declared and managed as "priority areas." Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that

			the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including: » The construction of a road, powerline, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; and » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent. Stand alone HIAs are not required where an EIA Process is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.	South African Heritage Resources Agency	A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development. A HIA has been undertaken as part of the EIA Process to identify heritage sites.
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR 152 of 23 February 2007:	Department of Environmental Affairs	As the applicant will not carry out any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard. Specialist flora and fauna studies have been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and

	Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA Phase.		protected species and the potential for them to be affected has been considered.
Conservation of Agricultural Resources Act (Act No 43 of 1983)	Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Weeds are described as Category 1 plants, while invader plants are described as Category 2 and Category 3 plants. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.	Department of Agriculture	While no permitting or licensing requirements arise from this legislation, this Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous

	due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance Group IV: any electronic product; and Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. S(2 - 4) provide general principles for land development and conflict resolution.	Local Municipality District Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out

			in the Act.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	Local Municipality District Municipality	Subdivision will have to be in place prior to any subdivision approval in terms of S24 and S17 of the Act.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 718), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste.	National Department of Water and Environmental Affairs Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMP (refer to Appendix J). The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).

	» Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		
Promotion of Access to Information Act (Act No 2 of 2000)	All requests for access to information held by state or private body are provided for in the Act under S11.	Department of Environmental Affairs	No permitting or licensing requirements.
Promotion of Administrative Justice Act (Act No 3 of 2000)	In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. Interested and affected parties have right to be heard.	Department of Environmental Affairs	No permitting or licensing requirements.
Northern Cape Nature Conservation Act, No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals	Department of Environment and Nature Conservation	No permitting or licensing requirements.

	from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; and » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. The Act provides lists of protected species for the Province.		

APPROACH TO UNDERTAKING THE EIA PHASE

CHAPTER 4

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

Figure 4.1: Phases within the EIA Process

The EIA Phase for the proposed Hantam PV Solar Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice GN33306 of 18 June 2010, in terms of Section 24(5) of NEMA (Act No. 107 of 1998). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

4.1. Scoping Phase

The Scoping Report aimed at detailing the nature and extent of the proposed facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and I&APs. In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives were investigated for consideration within the EIA process. However, no feasible and reasonable alternatives were identified for some aspects of the project. Details of

alternatives considered and reasons for not considering some of the alternatives is detailed in Chapter 2.

The Scoping Phase also provided interested and affected parties (I&APs) with the opportunity to receive information regarding the proposed project, to participate in the process and to raise issues or concerns. To further facilitate this, the draft Scoping Report was made available for public review and comment at the Loeriesfontein Library and on the Savannah Environmental website (www.savannahSA.com) between 16 November and 19 December 2011.

All the comments, concerns, and suggestions received during the Scoping Phase and the review period were included within the Final Scoping Report, which was submitted to the National Department of Environmental Affairs (DEA) together with a Plan of Study for the EIA Phase for acceptance. The Scoping Phase concluded in December 2011 with the acceptance of the final Scoping Report. In terms of this acceptance, an EIA was required to be undertaken for the proposed project as per the accepted plan of study. In addition, it is required that comments from the relevant organs of state are submitted with the Final Environmental Impact Report (EIR), and that the EIR report is to contain a construction operational phase Environmental Management Programme (EMPr).

4.2. Environmental Impact Assessment Phase

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess identified feasible alternatives put forward as part of the project.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA addresses potential environmental impacts and benefits associated with all phases of the project including design, construction, operation, and decommissioning, and aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

4.3. Overview of the EIA Phase

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

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of GN R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

These tasks are discussed in detail below.

4.3.1 Authority Consultation

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

» Submission of a final Scoping Report following a 30-day public review period and consideration of stakeholder comments received.
» Ad hoc discussions with DEA and NCDENC in order to clarify the findings of the Scoping Report and the issues identified for consideration in the EIA Phase.
» Submission of Application form amendment letters to split the project into seven phases. Application reference numbers **12/12/20/2049/1** to **12/12/20/2049/7** were received for each of the proposed seven phases.

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

» Submission of a final EIA Report following the 30-day public review period.
» Provision of an opportunity for DEA and NCDENC representatives to visit and inspect the proposed site, and the study area.

» Consultation with Organs of State that may have jurisdiction over the project, including:
  * Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc.).
  * Government Structures (including the Department of Public Works, Roads and Transport, etc)

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

4.3.2 Public Involvement and Consultation

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

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

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

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

Table 4.1: Key stakeholder groups identified during the EIA Process

Stakeholder Group	Department
National and Provincial Authorities and Organs of State	» National Department of Environmental Affairs » Northern Cape Department of Environment and Nature Conservation » Department of Energy » Northern Cape Department of Water Affairs » Northern Cape Department of Agriculture, Forestry and

	Fisheries » Ngwao Boŝwa ya Kapa Bokone (the Northern Cape Heritage Authority). » South African Heritage Resources Agency
Municipalities	» Hantam Local Municipality » Namakwa District Municipality
Public stakeholders	» Adjacent and surrounding landowners » Loeriesfontein residents and local business owners
Parastatals & service providers	» Eskom Distribution
NGOs/Business forums	» Wildlife Society of South Africa (Northern Cape) » Birdlife South Africa

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

» **Newspaper Advertisements**

As part of the EIA phase a newspaper advert was placed in the Noordwester to on 11 November 2011:

- to notify and inform the public of the proposed project and invite members of the public to register as I&APs
- to inform the public of the public meeting and the review period for the Draft Scoping Report

» **Stakeholder Engagement**

In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA phase, including:

* **Focus group meetings** (stakeholders invited to attend)
* **Public feedback meeting** (public invited to attend)
* One-on-one **consultation meetings** where required (for example with directly affected or surrounding landowners)
* **Telephonic consultation** sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants)
* Written, faxed or e-mail **correspondence.**

The public meeting will serve to provide feedback on the findings of the EIA studies undertaken. Stakeholders are invited to attend the public meeting to be held on:

Date: 07 February 2012
Time: 17:00
Venue: Loeriesfontein Community Hall, Rossouw Street, Loeriesfontein

Records of all consultation undertaken will be included within Appendix D.

4.3.3 Identification and Recording of Issues and Concerns

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

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

4.3.4 Assessment of Issues Identified through the Scoping Process

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

Table 4.1: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
David Hoare Consulting cc	Ecology, flora and fauna	Appendix F
Terrasoil Science	Soil, agricultural potential and land capacity	Appendix G
Heritage Contracts and Archaeological Consulting	Heritage	Appendix H
GCS	Visual	Appendix I
Tony Barbour	Social	Appendix J

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

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international.

A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)

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

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

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

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

P = Probability

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

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

As Solar Capital has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft EMP is included as Appendix K for each project phase (Appendix K1 to K7).

4.3.5 Assumptions and Limitations

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

» All information provided by Solar Capital and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by Solar Capital represents a technically suitable site for the establishment of the proposed solar facility.
» It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

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

4.3.6 Public Review of Draft EIA Report

This Draft EIA report has been made available for public review from **18 January 2012 to 16 February 2012** at the following locations:

» www.savannahSA.com
» Loeriesfontein Public Library

All registered I&APs were notified of the availability of the report and public meeting by letter. An advert has been placed in the Noordwester, a local newspaper to inform the public and I&APs of the availability of the Draft Environmental Impact Report (EIR) for review and invite I&Aps to attend the public meeting (refer to Appendix D).

4.3.7 Final Environmental Impact Assessment (EIA) Report

The final stage in the EIA Phase will entail the capturing of responses from I&APs on the Draft EIA Report in order to refine the EIA report. The Final EIA report will be submitted to the decision-making Authorities, and it is this Final report upon which a decision will be made regarding the proposed project.

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

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

5.1. Regional Setting and the Study Area

5.1.1 Regional Settings

The site identified for the proposed Hantam PV Solar Energy Facility is situated on Farm Narosies 228, which lies approximately 47 km north of Loeriesfontein within the Hantam Local Municipality. The Hantam Local Municipality falls within the Namakwa District Municipality and covers an area of approximately 27 968 km² (~22% of the greater Namakwa District Municipality).

The Hantam Local Municipality is bordered in the north by the District Management Area (NCDMA06), in the east by the Karoo Hoogland Local Municipality, in the south by the DMA (NCDMA06) and in the west by the Western Cape Province.

5.1.2 The study site

The proposed site is in a rural/remote area of western portion of Northern Cape, approximately 47 km northeast of the town of Loeriesfontein, 65 km southwest of the settlement of Granaatboskolk, 111 km northeast of Nieuwoutsville, 171 km west of Brandvlei, 131 km northwest of Calvinia (Municipal administrative centre for Hantam Local Municipality) and 775 km southwest of the Provincial capital of Kimberley. The dominant land use activity in the area is farming, specifically livestock farming (sheep/wool), lucerne and rooibos tea cultivation. The Calvinia area is at the centre of one of South Africa's largest wool-producing districts. The Dwaggas Soutwerke (pan brine salt works) is located 46 km north of the proposed site.

The proposed site is located on private, agricultural land that is largely uninhabited. According to the landowner of Farm Narosies 228 (who currently resides in capetown), the nearest inhabited farmstead in the area is located on Farm Stinkputs, which is located ~ 11 km east of the site.

5.2. Climatic Conditions

The mean annual rainfall for the site is 140 - 190 mm per year. All areas with less than 400 mm rainfall are considered to be arid. The study area can therefore be considered to be arid to very arid. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for the area (Loeriesfontein) range from 17°C in July to 31.8°C in February. The region is the coldest during July when the temperatures drop to 2.4°C on average during the night.

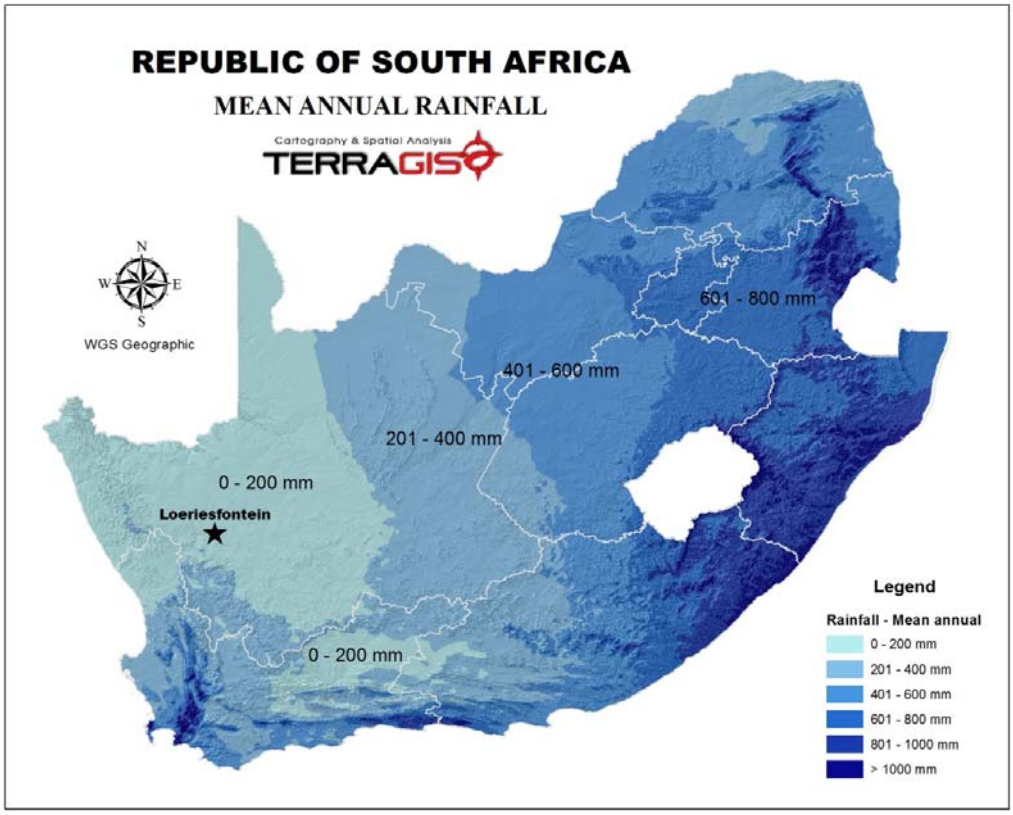

Figure 5.1: Rainfall map of South Africa indicating the location of the study site

5.3 Biophysical Characteristics of the Study Area and Surrounds

5.3.1 Topography

The topography of all the seven sites is similar. The study site lies on relatively level terrain with small undulations and a south-south-westerly aspect. The altitude varies between 820 m above mean sea level in the south to 980 m in the north (refer to Figure 5.2 below).

5.3.1 Land Types (Soils) and Agricultural Potential

The study site falls into the **Fc467**, **Fc468** and **Fc474** land types (Land Type Survey Staff, 1972 - 2006). Table 5.1 summarises the land types applicable to each phase of the proposed development.

Table 5.1: Land types for the seven development phases of the project

Project Phase	Land types
Hantam 1 PV Solar Energy Facility	Fc474
Hantam 2 PV Solar Energy Facility	Fc474
Hantam 3 PV Solar Energy Facility	Fc474, Fc468
Hantam 4 PV Solar Energy Facility	Fc474
Hantam 5 PV Solar Energy Facility	Fc468
Hantam 6 PV Solar Energy Facility	Fc474
Hantam 7 PV Solar Energy Facility	Fc467

Figure 5.3 provides the land type map of the site. A brief description of the land types Fc467, Fc468 and Fc474 in terms of soils, land capability, land use and agricultural potential is provided below:

» ***Soils***: Predominantly shallow and rocky soils with lime and/or gypsum throughout the profiles. The soils vary from red to yellow-brown and bleached to white due to the presence of the lime ad gypsum. The entire area, except drainage depressions, is characterised by a varying degree of surface rock (desert pavement) or rock outcrops. Numerous drainage depressions occur with soil material eroded from higher lying areas deposited in the depressions. The depression areas are characterised by soils with signs of incipient pedogenesis in the form of cutanic character and alluvial stratification.
» ***Land capability and land use***: Exclusively extensive grazing due to climatic and soil constraints. Soil erosion is a distinct risk due to low vegetation cover and shallow soils.
» ***Agricultural potential***: The agricultural potential of the site is very low due to the low rainfall (less than 200 mm per year), as well as the predominance of rocky and shallow soils.

The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. Discussions with farmers in the area indicated that the long-term sheep carrying capacity of the area is 14ha per ewe (with lamb). Under such conditions farms have to exceed 20 000 ha to approach an economically viable farming unit. No signs of irrigated agriculture were identified during the soil survey.

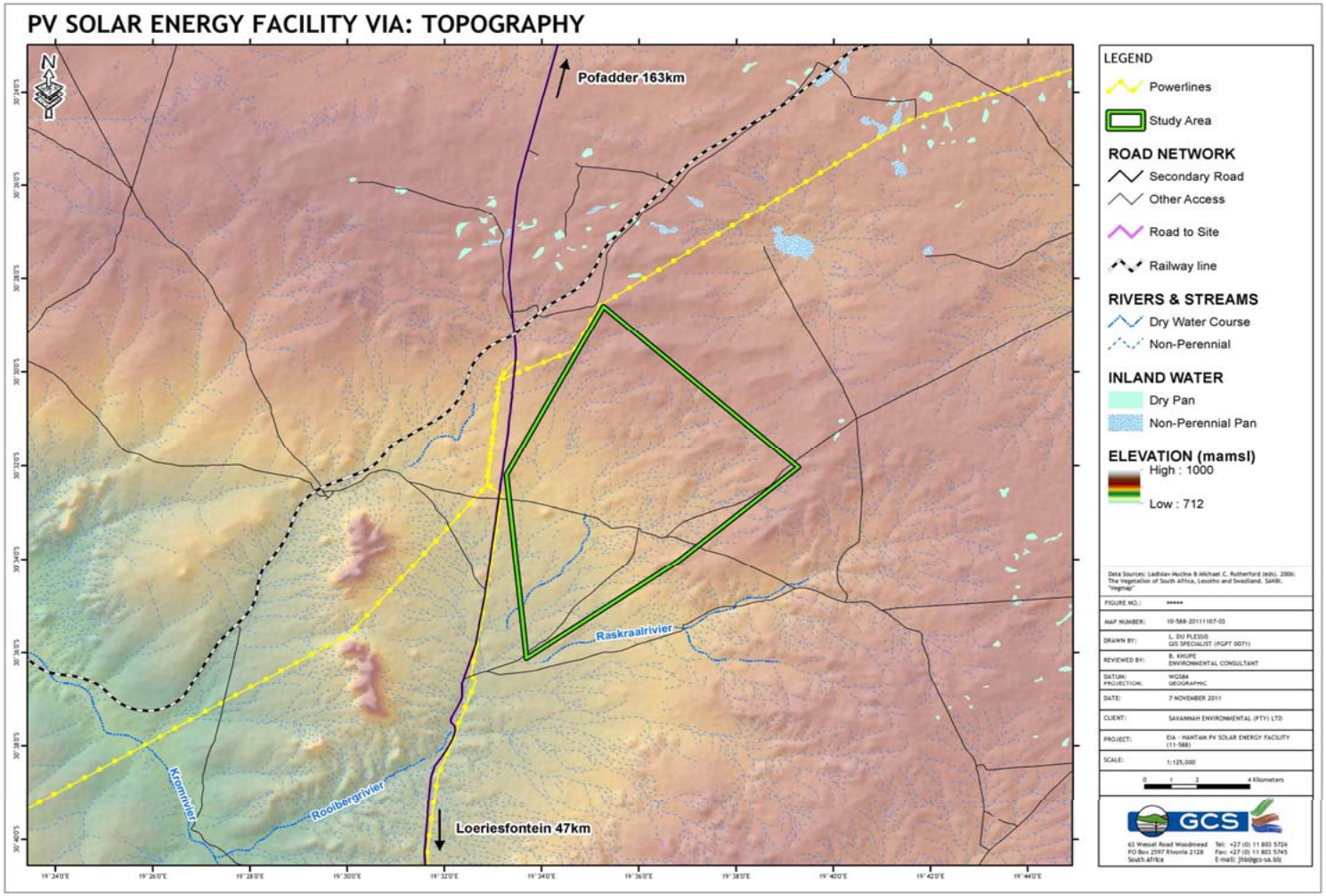

Figure 5.2: Shaded relief map (indicating the location of the proposed facility, the topography and elevation above sea level) of the broader study area

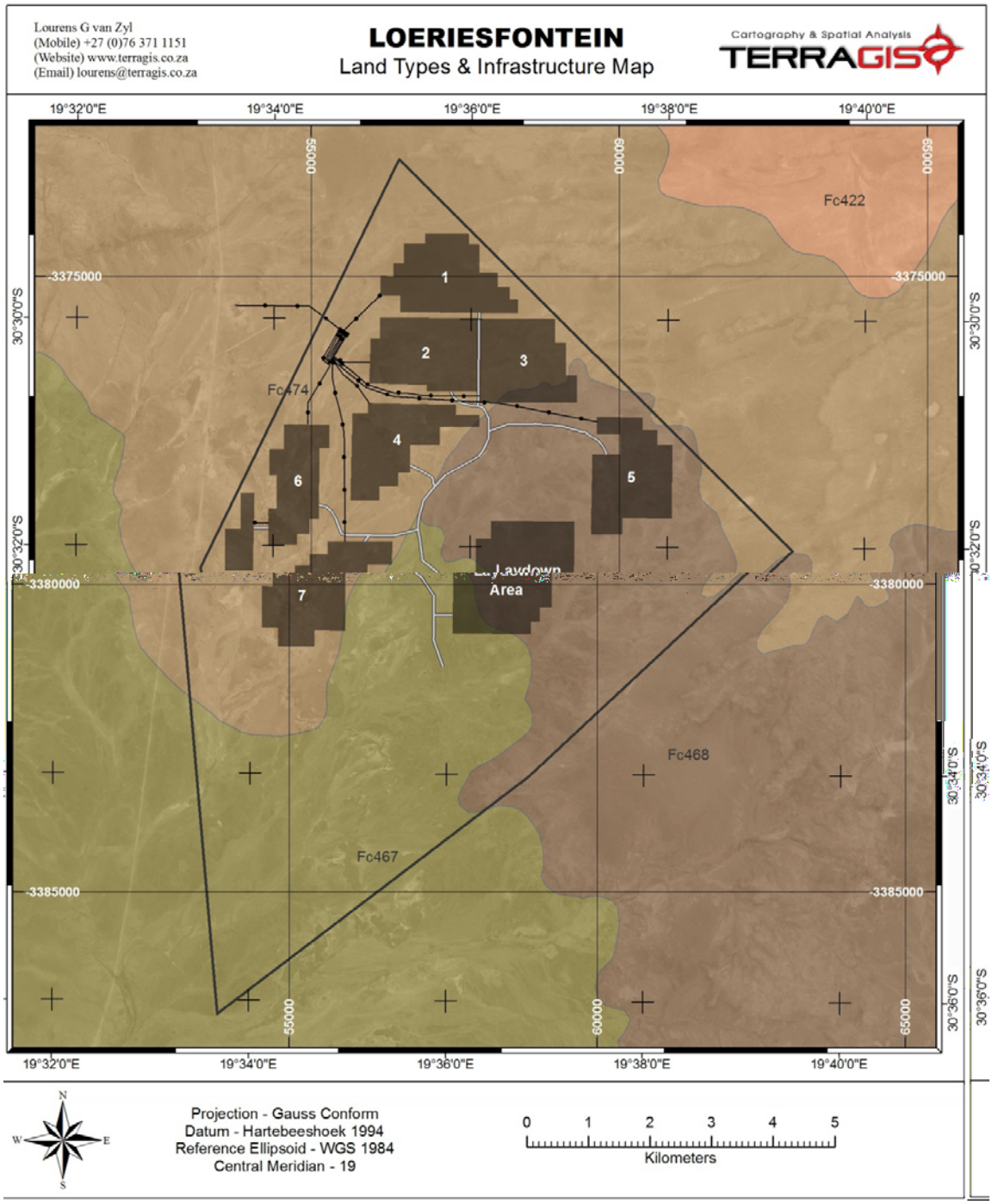

Figure 5.3: Map indicating the and types of the site as well as the planned infrastructure

5.3.2 Ecological Profile

Vegetation

The study site falls within the Bushmanland Basin Shrubland and a small sliver the south-western corner of the site falls within the Hantam Karoo vegetation type. From Figure 5.4 below it can be noted that the site proposed for development of the seven phases of the Hantam PV Solar Energy facility falls within the Bushmanland Basin Shrubland vegetation type.

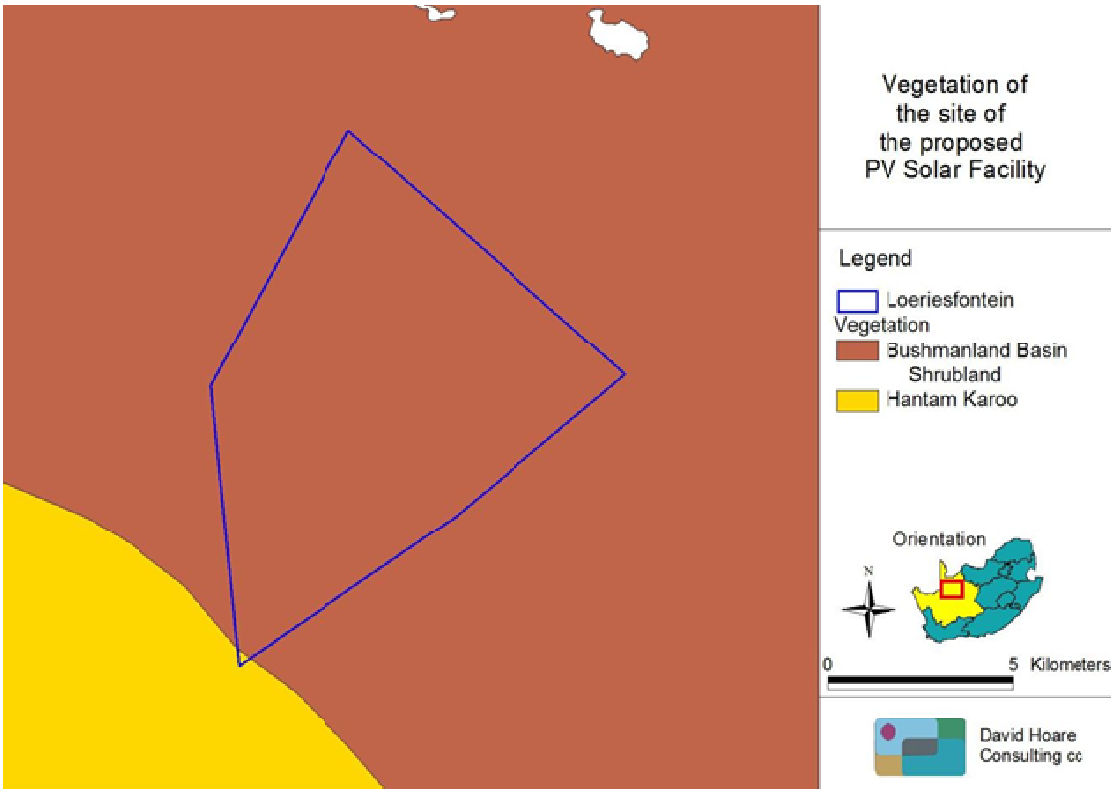

Figure 5.4: Vegetation types of the site proposed for development

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.

This vegetation type is however classified as Least Threatened and has a wide distribution and extent (Driver *et al*. 2005; Mucina *et al*., 2006). In addition, the vegetation type is not listed in the Draft National List of Threatened Ecosystems (GN1477 of 2009). The natural vegetation across most of the site is therefore not considered, from this perspective, to have high conservation status.

Most of the study site appears to be in a natural condition. Any highly degraded areas on site are likely to be classified as having low sensitivity and conservation value.

Critical Biodiversity Areas

Critical Biodiversity Areas have been identified for all municipal areas of the Northern Cape Province and are published on the SANBI website (bgis.sanbi.org). These maps identify no areas of concern in the study area or the immediate surroundings (refer to Figure 5.5 below).

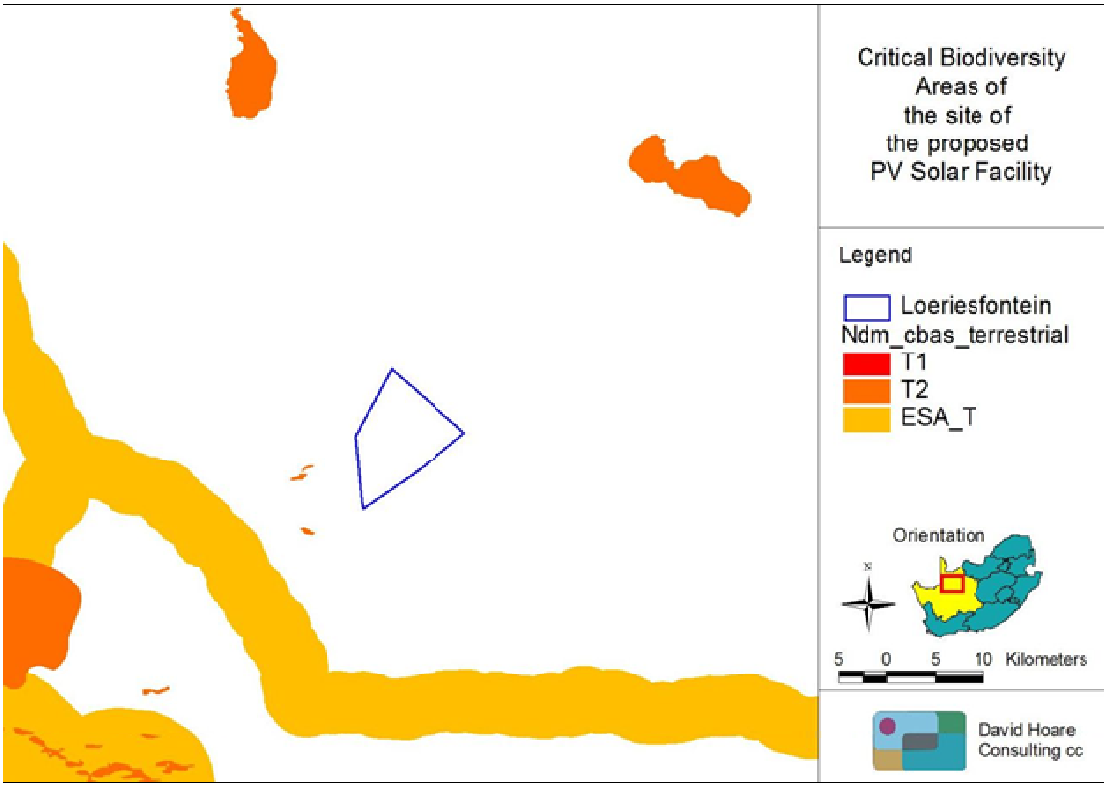

Figure 5.5: Critical Biodiversity Areas of the site proposed for development

Red List plant species

The purpose of listing Red List plant and animal species is to provide information on the potential occurrence of species of special concern in the study area that may be

affected by the proposed infrastructure. Species appearing on these lists can then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species of conservation concern previously recorded in the area and any other species with potential conservation value. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute for the quarter degree squares within which the study area is situated. The list can be found in Appendix 1 of the Ecology Specialist Report (refer to Appendix F). 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.

The species on this list were evaluated to determine the likelihood of any of them occurring on site on the basis of habitat suitability. Of the species that are considered to occur within the geographical area under consideration, there is one species of conservation concern recorded in the quarter degree grid that could occur in habitats that are available in the study area, *Hoodia gordonii*. This species was however not found during the field survey. According to IUCN Ver. 3.1 (IUCN, 2001) this species is listed as Declining. Species listed as Declining are a low conservation priority and not considered to be threatened.

Red List animal species

All Red List vertebrates (mammals, birds, reptiles, amphibians) that could occur in the study area are listed in Appendix 2 of the Ecological Specialist Report (refer to Appendix F). Those vertebrate species with a geographical distribution that includes the study area, and habitat preference that includes habitats available in the study area are discussed further.

There are two mammal species of low conservation concern that could occur in available habitats in the study area, i.e. the Honey Badger and Littledale's Whistling Rat, both of which are listed as Near Threatened in South Africa (Friedmann & Daly 2004) and Least Concern globally (www.iucn.org).

There are six threatened bird species (all Vulnerable) and four Near Threatened bird species that have a medium to high probability of utilising available habitats in the study area, either for foraging or breeding. Breeding birds are most likely to be directly affected by development of infrastructure on site. The three species most likely to use parts of the site for breeding are the Kori Bustard, Ludwig's Bustard and Sclater's Lark. The Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle,

Peregrine Falcon, Red Lark and Secretarybird may also use the site or parts of the site for foraging.

There are no threatened amphibian species that have a distribution that includes the study area.

There are no threatened reptile species have a distribution that includes the study area.

Protected plants

A large proportion of the plant species that could occur on site (except for the most common) are protected according to the Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009). According to the Northern Cape Nature Conservation Act, "*No person shall without a permit pick, import, export, transport, possess, cultivate or trade in a specimen of a* (*specially*) *protected plant* ". The Act does not imply that habitat for these species should be regarded as sensitive. The interpretation of this Act is that the Act is concerned with protecting individual plant species from harvesting or trading in a general sense and is not concerned specifically with destruction of habitat or individuals, as would occur with this development. No permit requirements are contained in the Act for cases where such individuals may occur on land for which an application for development is being considered (as in the current case). The interpretation is, therefore, that species of conservation concern are covered by general authorisations according to NEMA and NEMBA.

There are a number of plant 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. Only one species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) has a geographical distribution that includes the site and that may, therefore, occur on the site. This is the species *Hoodia gordonii*.

Hoodia gordonii has a wide tolerance of growing habitats and is found in deep Kalahari sands, on dry stony slopes or flats and under the protection of xerophytic bushes. Suitable conditions do occur on site and it is considered possible that this species occurs on site, although it was not found during the field survey.

Protected animals

There are a number of animal species protected under the Northern Cape Nature Conservation Act of 2009 (Act No 9 of 2009). These are listed in Appendix 6 of the Ecological Specialist Report (see Appendix F). According to the Northern Cape Nature Conservation Act, "*No person shall without a permit hunt, import, export, transport, keep, possess, breed or trade in a specimen of a* (*specially*) *protected animal* ". The Act does not imply that habitat for these species should be regarded as sensitive and appears to be primarily concerned with protecting individual animals from hunting or trading. No permit requirements are contained in the Act for cases where such individuals may occur on land for which an application for development is being considered (as in the current case).

Those species protected according to the Northern Cape Nature Conservation Act of 2009 (Act No 9 of 2009) that have a geographical distribution that includes the site and that may, therefore, occur on site are listed in Appendix 5 of the Ecological Specialist Report (see Appendix F), marked with the letter "P". A large proportion of the species (except for the most common) are protected according to the Northern Cape Nature Conservation Act of 2009.

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 and that may, therefore, occur on site are listed in Appendix 5 of the Ecological Specialist Report (see Appendix F), marked with the letter "N". This includes the following species that are considered to potentially occur on site:

- Black-footed Cat,
- Honey Badger,
- Leopard,
- Cape Fox,
- Black Stork,
- Kori Bustard,
- Lesser Kestrel,
- Ludwig's Bustard,
- Martial Eagle, and

- Peregrine Falcon.

Protected trees

- Tree species protected under the National Forest Act are listed in Appendix 3 of the Ecology Specialist Report (refer to Appendix F). Only one has a geographical distribution that includes the study area, that is *Acacia haematoxylon* (Grey Camel Thorn, Vaalkameeldoring).

Acacia haematoxylon occurs on deep Kalahari sand between dunes or along dry watercourses. This species has a geographic distribution that is indicated in the literature (van Wyk & van Wyk 1997) as occurring in the area, but collection records for this species obtained from the SANBI website (http://sibis.sanbi.org/) indicate that this species does not occur anywhere near to the site. The collection records are a more reliable indicator of distribution, since they are based on observation of individual plants in the field. The SANBI distribution records also match the habitat preference for the species (Kalahari Basin). The closest known collection of this species to the site is from north-east of Kenhardt, more than 230 km away. No individuals were observed on site or in the surrounding areas.

Wetlands

Potential factors that may lead to parts of the study area having elevated ecological sensitivity are the presence of drainage lines. There are various drainage lines draining the study area, all non-perennial. These drain in a south-westerly direction towards the Rooiberg River.

Perennial and non-perennial rivers and streams represent a number of ecological processes including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal. Wetlands (including drainage lines) are protected under national legislation (the National Water Act). According to the National Water Act, these are classified as water resources. However, based on the soil survey it was determined that these areas do not constitute wetlands according to the wetland delineation guidelines (DWAF, 2005).

Figure 5.6: Drainage features on site with coarse alluvial deposits

5.4. Social Characteristics of the Study Area and Surrounds

5.4.1 Economic Profile

In terms of economic importance, the Northern Cape's share of the country's Gross Domestic Product (GDP) in 2002 was 2%, the lowest contribution of the nine provinces. However, although the Northern Cape Province has the smallest economy of the nine provinces, Gross Domestic Product of the Region (GDPR) per capita is higher than the national average. In terms of economic activities, the economy of Northern Cape is heavily dependent on the primary sectors of the economy, which in 2002 made up 31.0% of GDPR. The largest sector is mining which has declined in contribution to the GDPR from 25.8% in 1996 to 23.7% in 2002. Agriculture, on the other hand, increased in its contribution from 6.2% to 7.3%.

A worrying characteristic of the economy is the limited amount of processing of the primary commodity output in mining and agriculture that takes place in the Northern Cape. This is reflected in the fact that manufacturing contributes only 4.2% towards GDPR. All the industries in the secondary sector have decreased in their contribution to the GDPR, with electricity and water sector showing the

greatest decrease of 0.7% and the construction industry making the lowest contribution of 1.9% to the GDPR of the Northern Cape. At the same time the contribution to regional GDPR by industries in the tertiary sector increased, with the exception of the wholesale and retail industry, which decreased by 1.1%.

5.4.2 Demographic Profile

The Namakwa District's total population was estimated at 126 494 people, with the Hantam Local Municiplaity accounting for ~17% (21 234) of that figure (Community Survey, 2007). The total population growth between 2001 and 2007 is estimated at 7.4%. According to the Hantam Local Municipality IDP, the majority of the population in the local municipality lives in the town of Calvinia and the other major settlements of Nieuwoutsville, Loeriesfontein and Middlepos. The IDP (2011-2012) estimates that approximately 28% (6000 people) of the population live on farms within the local Municipality. Given the size of the Municipality and the relatively small total population size, the population density within the Municipality very low at 0.8 people per km^2. However, the population density within the main urban nodes of Calvininia, Nieuwoutsville, Loeriesfontein and Middlepos can be expected to be significantly higher than that of the surrounding rural areas were the proposed site is located.

According to the 2001 Census, the majority of the population in the Hantam Local Municipality was coloured (83.1%) followed by the White population group (15.5%) and the Black African and Asian population groups (1.4%).

The Hantam LM IDP notes that in 2007 there were slightly more females (52%) than males (48%) in the municipal area and suggests that this is a result of the fact that males have migrated to neighbouring/other areas in search of work opportunities.

In 2001, unemployment within the Municipality was estimated at just over 27% of the total labour force, which is on par with the Northern Cape average of ~27% while just under 29% of the population is not economically active[9]. The latter are made up of made up of scholars/students, homemakers/housewives, pensioners, the medically unfit, seasonal workers not currently employed, and those who choose not to work.

In 2001, the largest employment sector in the Hantam LM was the Agriculture Sector which employed an estimated 1 807 people, followed by the Community and

[9] The term "not economically active" refers to people of working age not actively participating in the economy, such as early retirees, students, the disabled and home-makers.

Personal Services sector (814), Private Households (658), and the Construction Sector (239).

5.4.3. Heritage Profile

No sites of heritage significance were identified to occur on the site during the survey.

5.5 Summary of the Environmental characteristics of the seven project development phases

Table 4.2 Summary of the characteristics of the seven project development phase's environment

Environmental Characteristics	Hantam 1	Hantam 2	Hantam 3	Hantam 4	Hantam 5	Hantam 6	Hantam 7
1. *Land Use and*	Grazing land (sheep farming)	Grazing land (sheep farming)	Grazing land (sheep farming)	Grazing land (sheep farming)	Grazing land (sheep farming)	Grazing land (sheep farming)	Grazing land (sheep farming)
2. *Land Capability*	Low	Low	Low	Low	Low	Low	Low
3. *Climate*	Arid	Arid	Arid	Arid	Arid	Arid	Arid
4. *Topography*	Flat	Flat	Flat	Flat	Flat	Flat	Flat
5. *Land Types*	Fc474	Fc474	Fc474, Fc468	Fc474	Fc468	Fc474	Fc474
6. *Agricultural Potential*	Low	Low	Low	Low	Low	Low	Low
7. *Vegetation types*	» Bushmanland Basin Shrubland » vegetation type is least threatened	» Bushmanland Basin Shrubland » vegetation type is least threatened	» Bushmanland Basin Shrubland » vegetation type is least threatened	» Bushmanland Basin Shrubland » vegetation type is least threatened	» Bushmanland Basin Shrubland » vegetation type is least threatened	» Bushmanland Basin Shrubland » vegetation type is least threatened	» Bushmanland Basin Shrubland » vegetation type is least threatened
8. *Heritage*	no sites of heritage significance identified	no sites of heritage significance identified	no sites of heritage significance identified	no sites of heritage significance identified	no sites of heritage significance identified	no sites of heritage significance identified	no sites of heritage significance identified
9. *Social Characteristics*	The study site is located in a remote/ rural section of the Hantam Local Municipality. Approximately 10 households/homesteads are located within the 10km radius around the site.						

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 1 PV SOLAR ENERGY FACILITY: CHAPTER 6

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 1 PV Solar Energy Facility**, as well as for all of the facility's components. (Project development phases Hantam 2 to 7 are assessed in the chapters that follow).

The **Hantam 1 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» A new overhead distribution **power line** (approximately 825 m) to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 6900 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 1 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas, transportation of components/construction equipment to site; and undertaking

site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

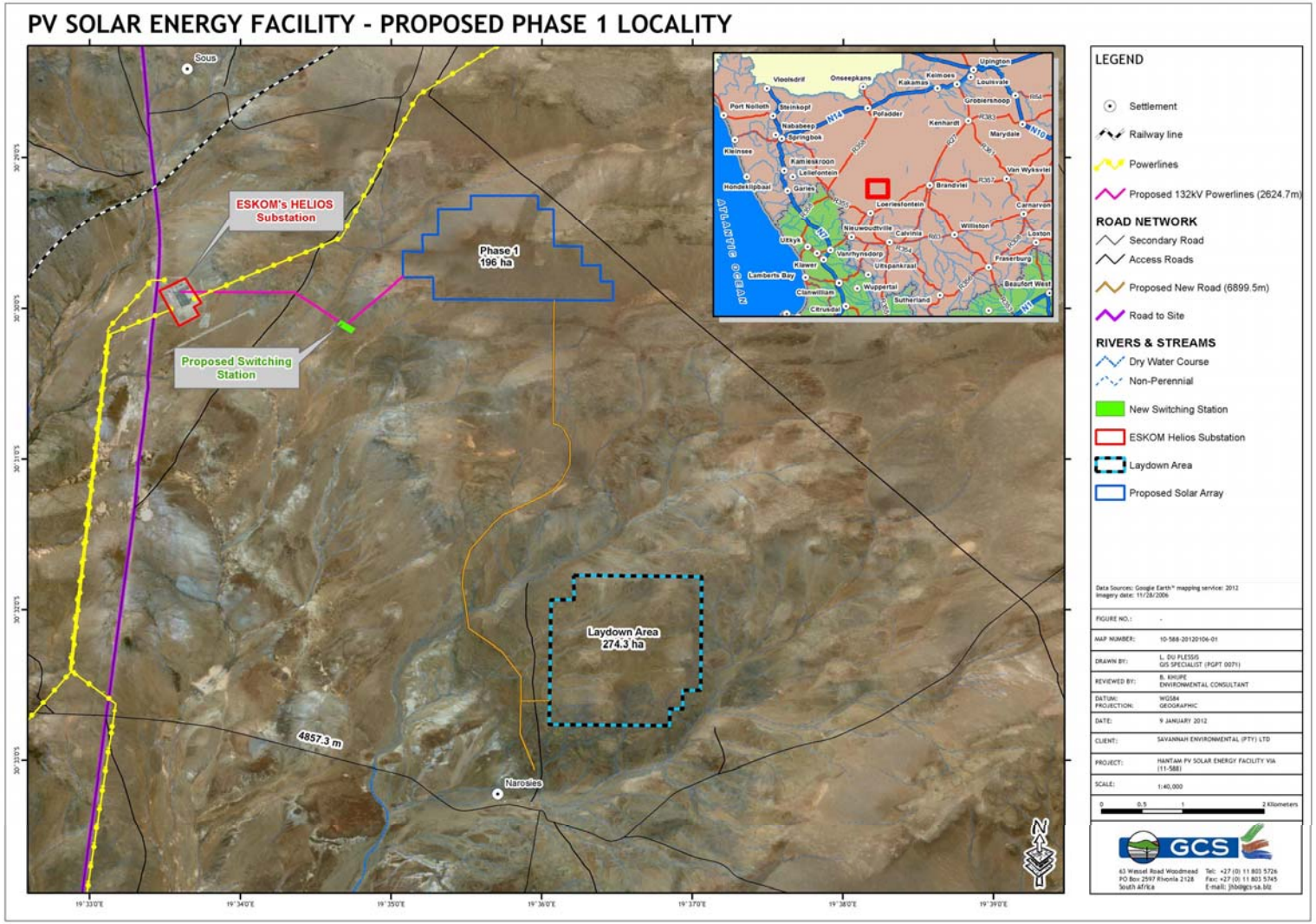

Figure 6.1: Preliminary layout of the proposed Hantam 1 PV Solar Energy Facility and associated infrastructure

6.1. Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[10].
» *Social and visual impacts* - from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 6.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[10] According to the National Water Act, these are classified as wetlands or water resources.

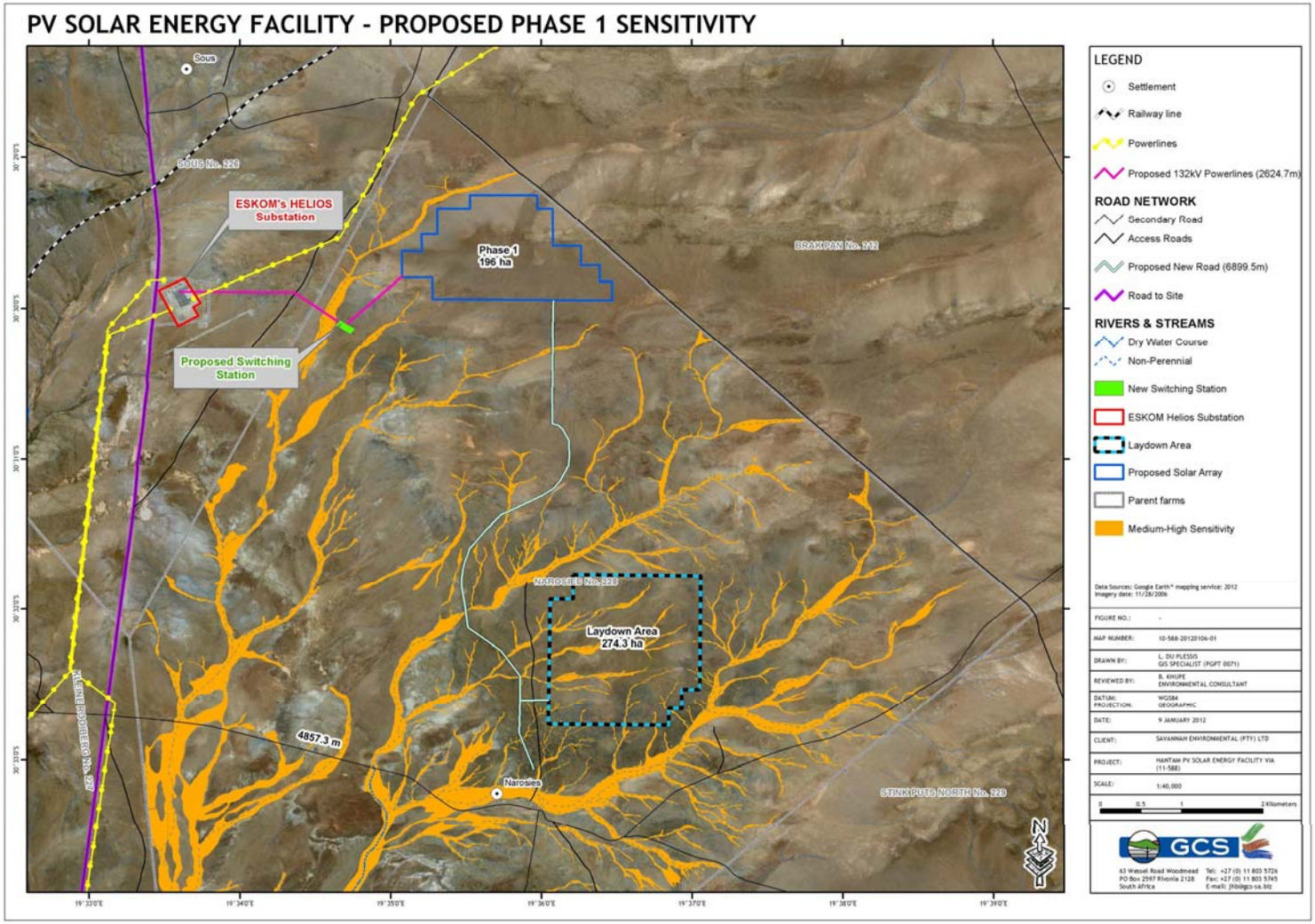

Figure 6.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

6.2. Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

6.3. Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 1 PV Solar facility. However, the development footprint will cover an area of approximately 196 ha in extent (for Hantam 1 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 6.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 1 PV Solar Energy Facility forms the first phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 1 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/1.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 1 PV Solar Energy Facility. The assessment of potential impacts associated with the other phases of the development (Hantam 2 to 7 PV Solar Energy Facility) is considered in Chapter 7 – 12 of this report respectively.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

6.4. Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 1 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 1 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	196
Distribution power line	2.1
Switching station	1
Access roads	3.45
TOTAL (ha)	(a total area of 202.55 ha of 6 764 ha) **~ 3 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

6.4.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)

Significance	**Medium (50)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		

Cumulative impacts:
Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts:
Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:
Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.
Cumulative impacts:
Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts:
Unlikely to be residual impacts.

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.

	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)

Magnitude	Moderate to Low (5)	Low (4)
Probability	definite (5)	Highly probable (4)
Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of	Yes	Yes

resources?		
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: » Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared.		

» Avoid unnecessary impacts on natural vegetation surrounding the power line servitude. Impacts should be contained, as much as possible, within the footprint of the infrastructure. » Service roads must be properly maintained to avoid erosion impacts.
Cumulative impacts: Soil erosion may lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts: None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)

There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species.

These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:
Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.

Cumulative impacts:
Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:
Unlikely to be residual impacts.

Nature: Bird collisions with power lines
There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:

Devices to make lines more visible must be attached to overhead power lines.
Cumulative impacts: None
Residual Impacts: None likely

Nature: Damage to wetland areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses

	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

(1) Place tower structures a minimum of 50 m from watercourses.
(2) Service roads in the servitude must be properly maintained to avoid erosion impacts.
(3) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)

Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

6.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.

Cumulative Impacts:

» The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.

Residual Impacts:

» None

Nature: disturbance of soils and impacts on existing land use due to construction of roads

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)

Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site

This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.

	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit vehicle movement to absolute minimum, construct appropriate roads for access.

Cumulative Impacts:

» The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.

Residual Impacts:

» None

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No

Mitigation*:*

The loss of agricultural land is a long-term loss and there are no mitigation measures that can be put in place to combat this loss. In the case of low agriculture potential, soil impacts

can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

6.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	Yes	
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

6.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 6.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

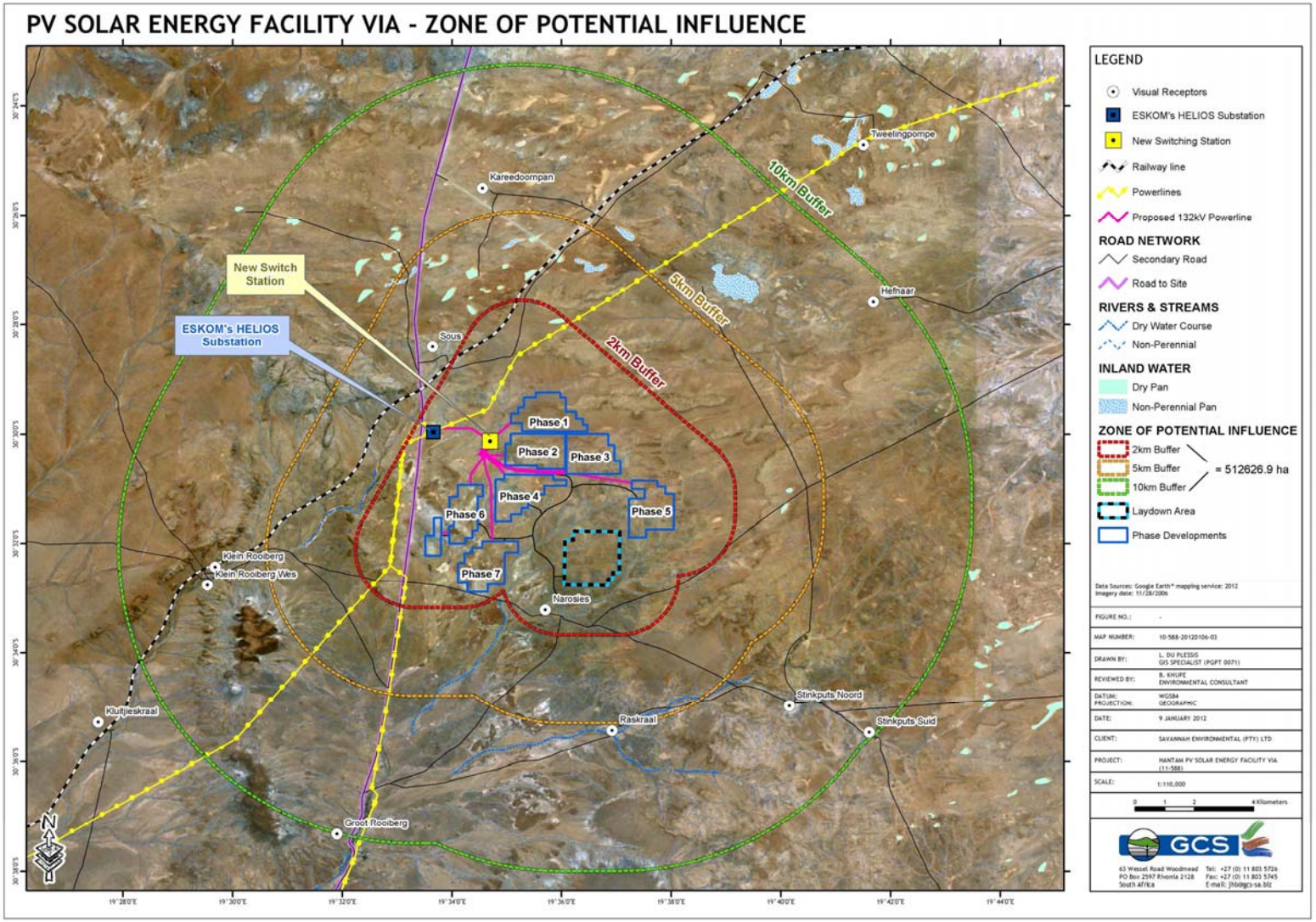

Figure 6.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 6.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 6.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in xtent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 65.9 % of the zone of influence. However, the viewshed of the facility has a 71.3% overlap with the viewshed of the existing Helios Substation. The Hantam 1 PV facility will be potentially visible to the following 7 homesteads/settlements:

- *Kareedoornpan,*
- *Hefnaar,*
- *Sous,*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*

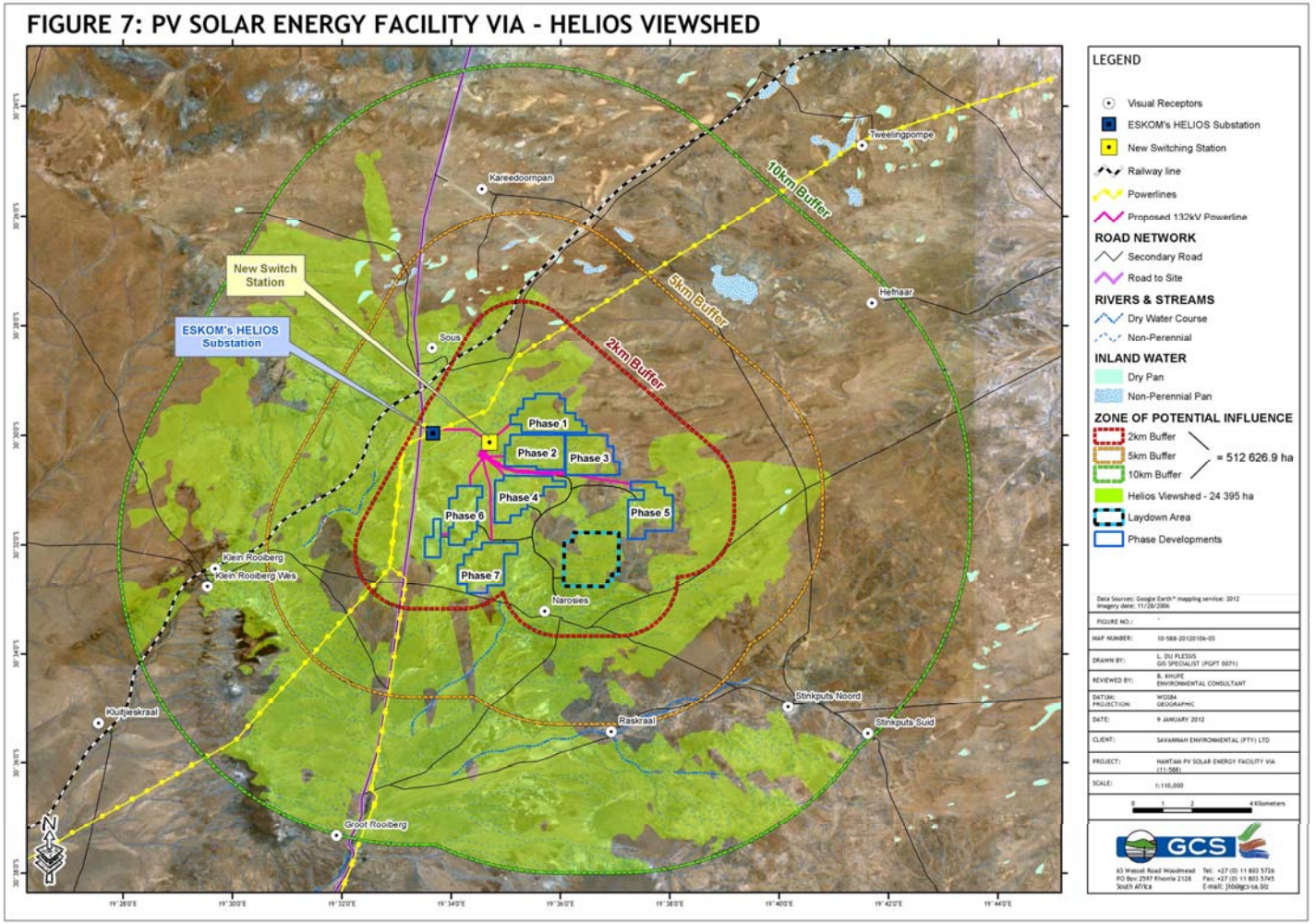

Figure 6.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

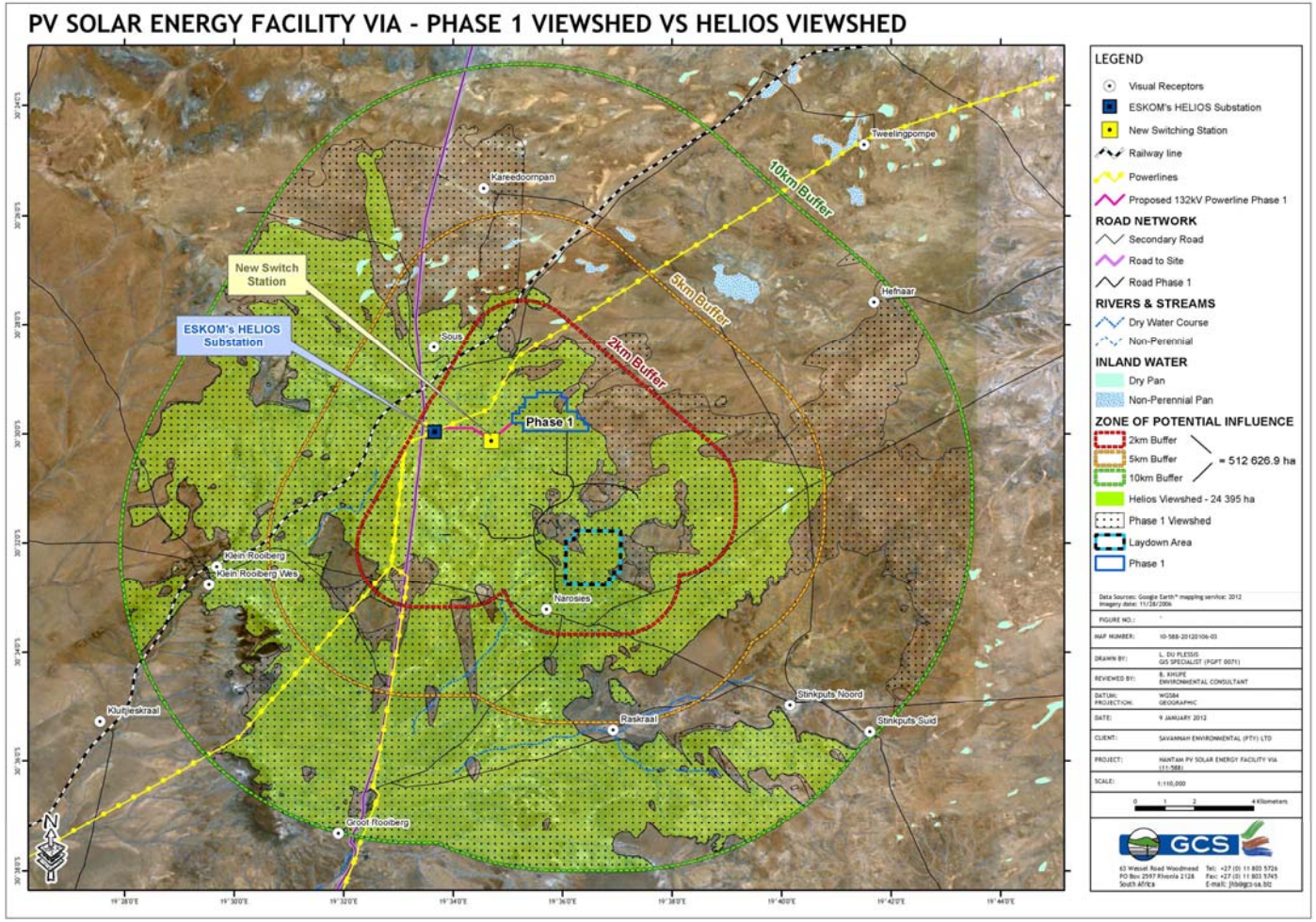

Figure 6.5: Potential visual exposure of the Hantam 1 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 1 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.
The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (45)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be medium given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

6.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 1 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and

10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the

tender process and invited to bid for project-related work; » Where possible, Solar Capital should assist local BEE companies to complete and submit the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	

Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**

» Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;

» Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;

» Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;

» Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;

» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;

» The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;

» The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;

» It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

» The size of the on-site construction camp should be kept as small as possible;

» The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;

» No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;

» Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;

» No non-mine workers should be allowed to spend the night at the construction camp; » All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled; » The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their	

	livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

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

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

» Solar Capital should enter into an agreement with the local farmers in the area

whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;

» Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;
» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining	Low (4)

	livelihoods	
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts**:** None, provided losses are compensated for.

Residual impacts**:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access

the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

Mitigation:

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake

the EIA (Savannah Environmental); » The implementation of the Rehabilitation Programme should be monitored by the ECO.
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.
Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[11]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		

[11] This assumes the establishment of some form of Community Trust

Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area
Residual impacts: See cumulative impacts

Nature: Promotion of clean, renewable energy		
	Without Mitigation	***With Mitigation*** *(The provision of renewable energy infrastructure is in itself a mitigation measure)*
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**High (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be enhanced?	Yes	
Enhancement: The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; » Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate

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

community services etc.
Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related

income.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)

Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of	No	

resources?		
Can impact be enhanced?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.		
Residual impacts: See cumulative impacts		

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 1 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.

» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

6.5. Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[12]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 2 PV SOLAR ENERGY FACILITY: CHAPTER 7

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 2 PV Solar Energy Facility**, as well as for all of the facility's components. (Project development phases Hantam 3 to 7 are assessed in the chapters that follow).

The **Hantam 2 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» An onsite **substation**
» A new overhead distribution **power line** (approximately 927 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 5919 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 2 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas,

transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

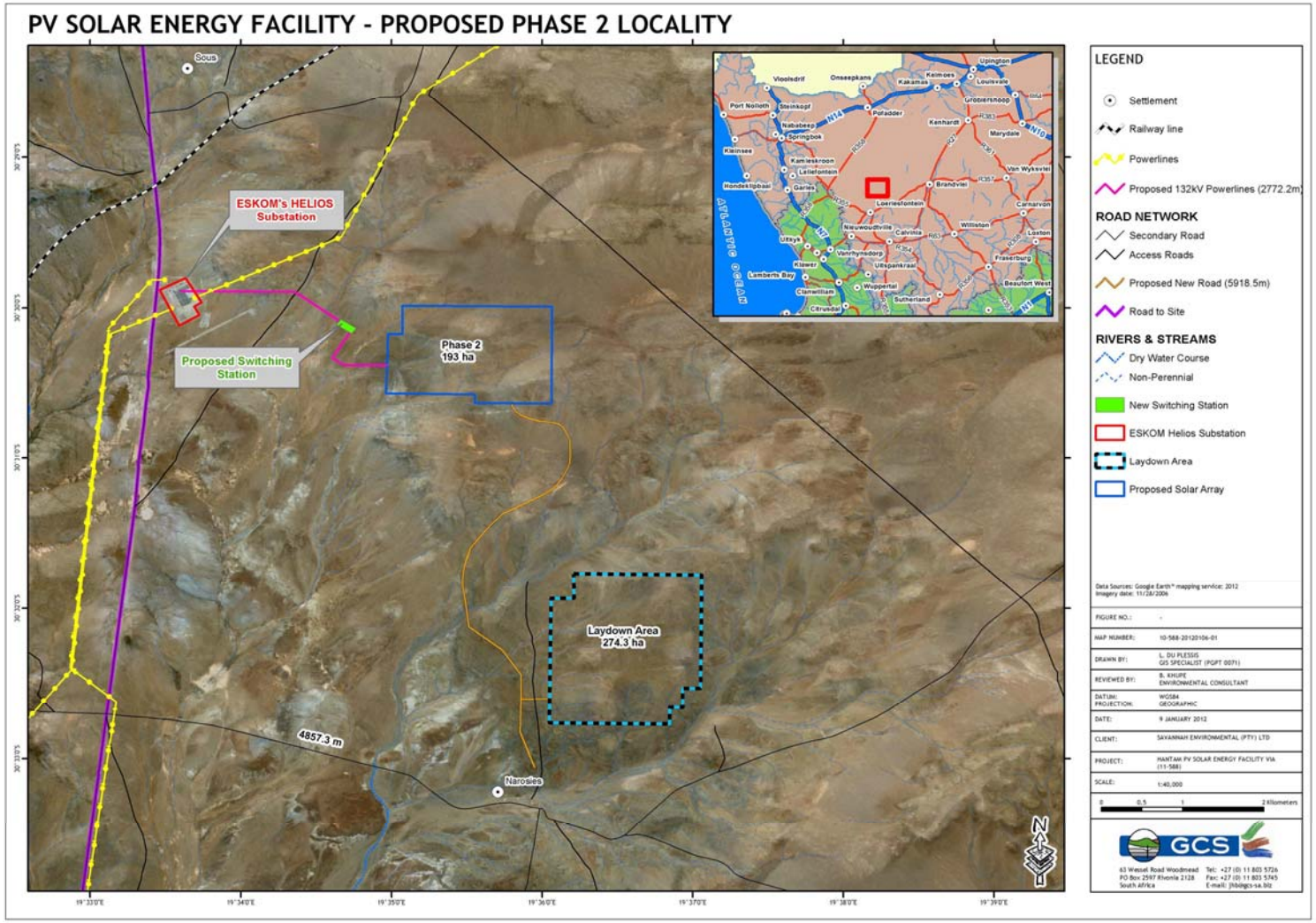

Figure 7.1: Preliminary layout of the proposed Hantam 2 PV Solar Energy Facility and associated infrastructure

7.1 Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[13].
» *Social and visual impacts* - from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 7.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[13] According to the National Water Act, these are classified as wetlands or water resources.

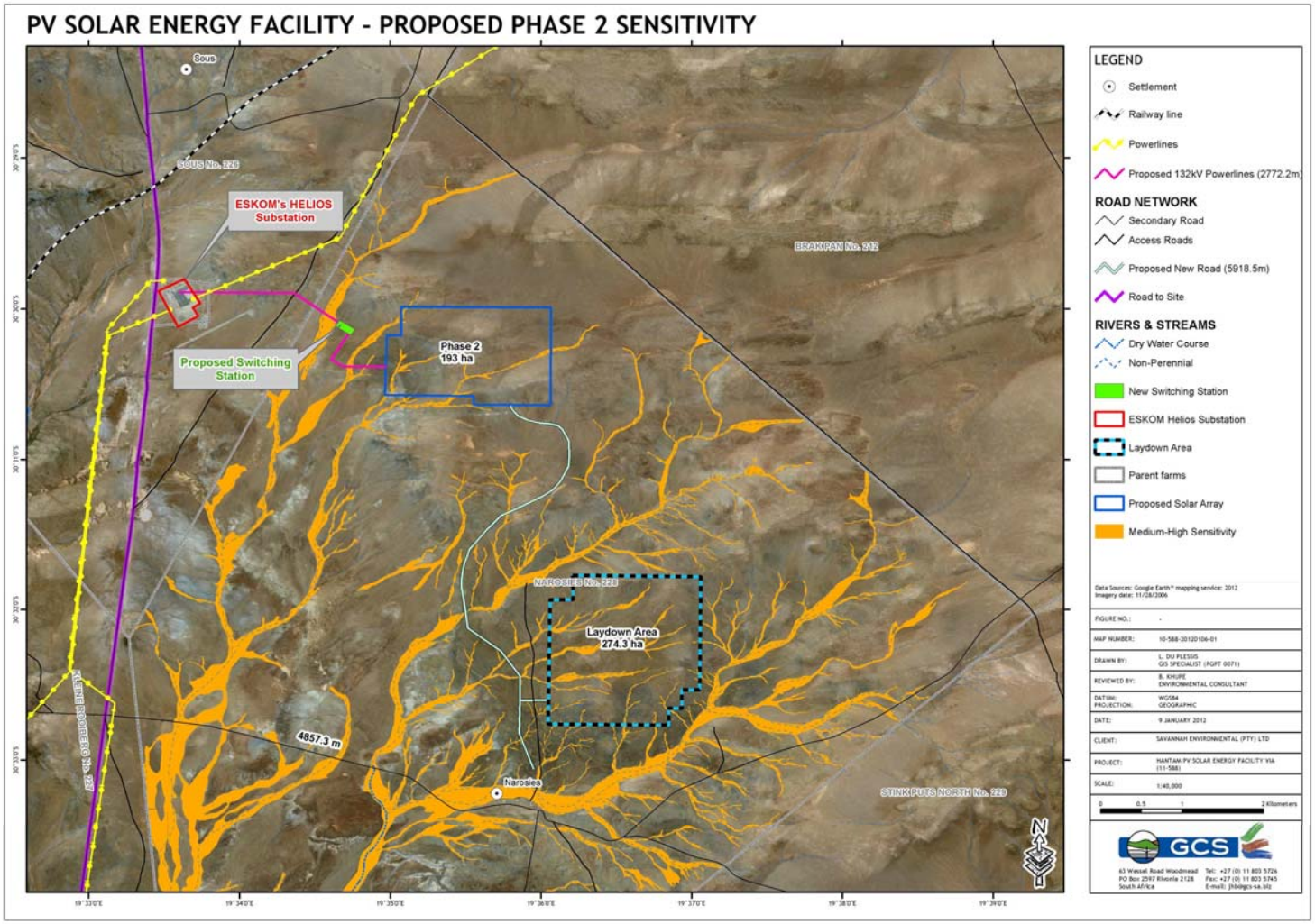

Figure 7.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

7.2 Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

7.3 Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 2 PV Solar facility. However, the development footprint will cover an area of approximately 193 ha in extent (for Hantam 2 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 7.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 2 PV Solar Energy Facility forms the second phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 2 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/2.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 2 PV Solar Energy Facility. The assessment of potential impacts associated with the other phases of the development (Hantam 3 to 7 PV Solar Energy Facility) is considered in Chapter 8 – 12 of this report respectively.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

7.4 Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 2 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 2 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	193
Distribution power line	2.2
Switching station	1
Substation	1
Access roads	2.96
TOTAL (ha)	(a total area of 200.16 ha of 6 764 ha) **~ 3 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

7.4.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**

Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts:		

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts: Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.

	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to Low (5)	Low (4)
Probability	definite (5)	Highly probable (4)

Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	To some degree	

mitigated?		
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: » Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared. » Avoid unnecessary impacts on natural vegetation surrounding the power line servitude. Impacts should be contained, as much as possible, within the footprint of the		

infrastructure. » Service roads must be properly maintained to avoid erosion impacts.
Cumulative impacts: Soil erosion may lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts: None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)

There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey

Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.		
Residual Impacts: Unlikely to be residual impacts.		

Nature: Bird collisions with power lines There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	
Mitigation: Devices to make lines more visible must be attached to overhead power lines.		
Cumulative impacts: None		

Residual Impacts: None likely

Nature: Damage to wetland areas resulting in hydrological impacts There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses		
	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (4) Place tower structures a minimum of 50 m from watercourses. (5) Service roads in the servitude must be properly maintained to avoid erosion impacts. (6) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.		
Cumulative impacts: Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.		
Residual Impacts: None.		

Nature: Establishment and spread of declared weeds and alien invader plants Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica, Opuntia imbricata, Prosopis glandulosa, Prosopis velutina, Atriplex numularia,* and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.		
	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)

Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

7.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.

Cumulative Impacts:

» The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.

Residual Impacts:

» None

Nature: disturbance of soils and impacts on existing land use due to construction of roads

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)

Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Limit vehicle movement to absolute minimum, construct appropriate roads for access.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.		
Residual Impacts: » None		

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).		
	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No
Mitigation*:* The loss of agricultural land is a long-term loss and there are no mitigation measures that can be put in place to combat this loss. In the case of low agriculture potential, soil impacts		

can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

7.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	Yes	

mitigated?		
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

7.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 7.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

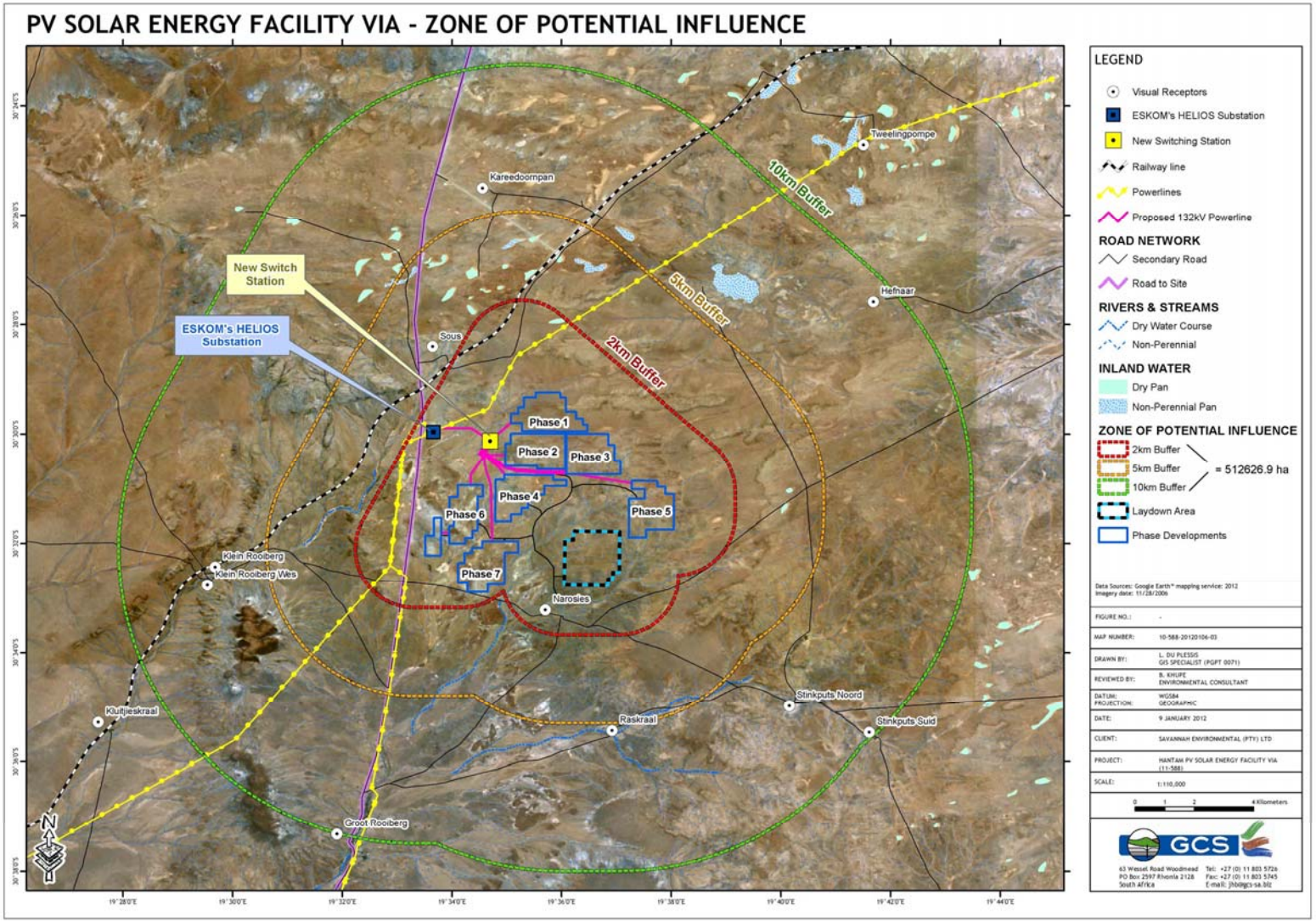

Figure 7.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 7.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 7.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in xtent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 58 % of the zone of influence. However, the viewshed of the facility has a 81.1 % overlap with the viewshed of the existing Helios Substation. The Hantam 2 PV facility will be potentially visible to the following 5 homesteads/settlements:

- *Sous,*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*

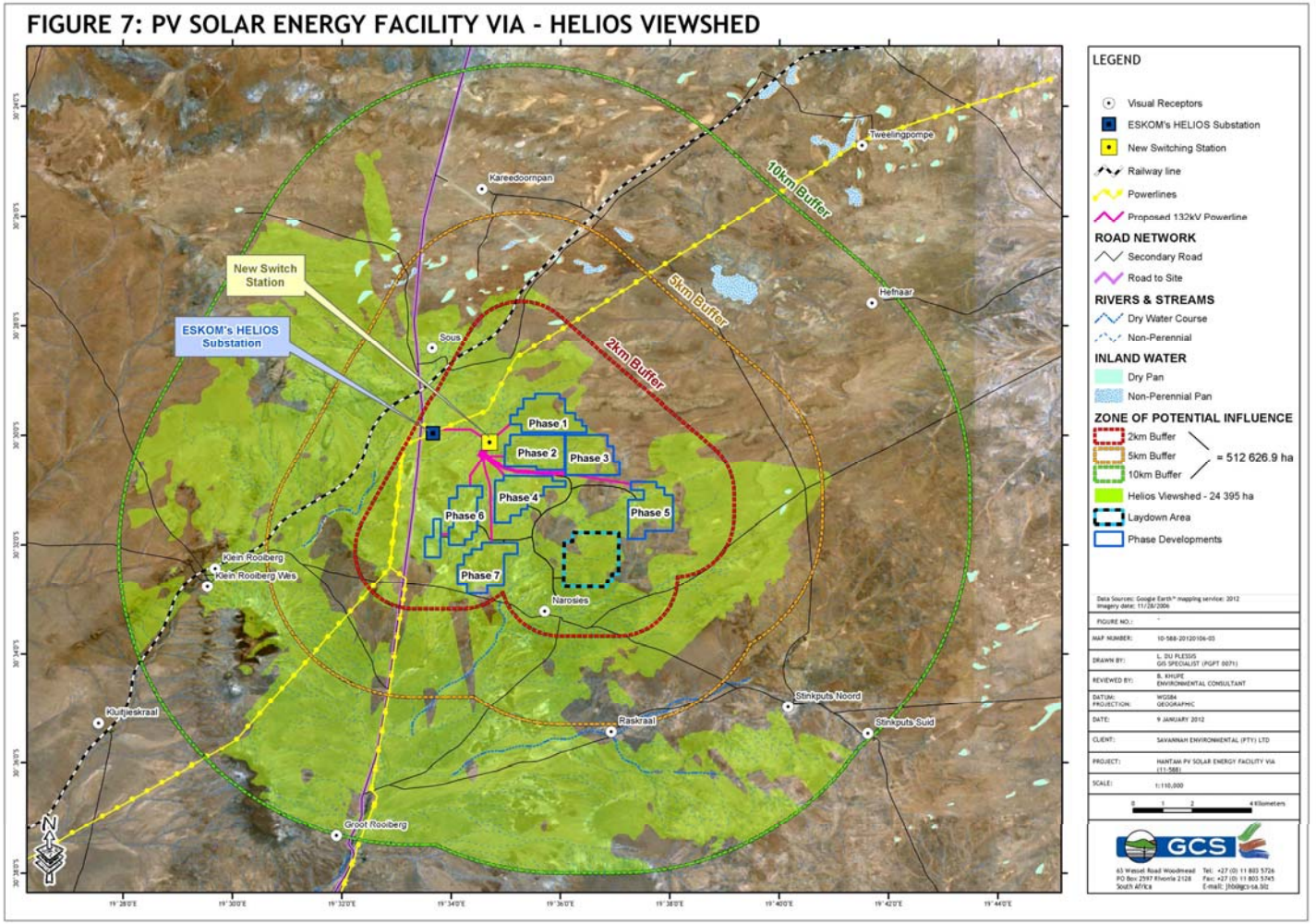

Figure 7.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

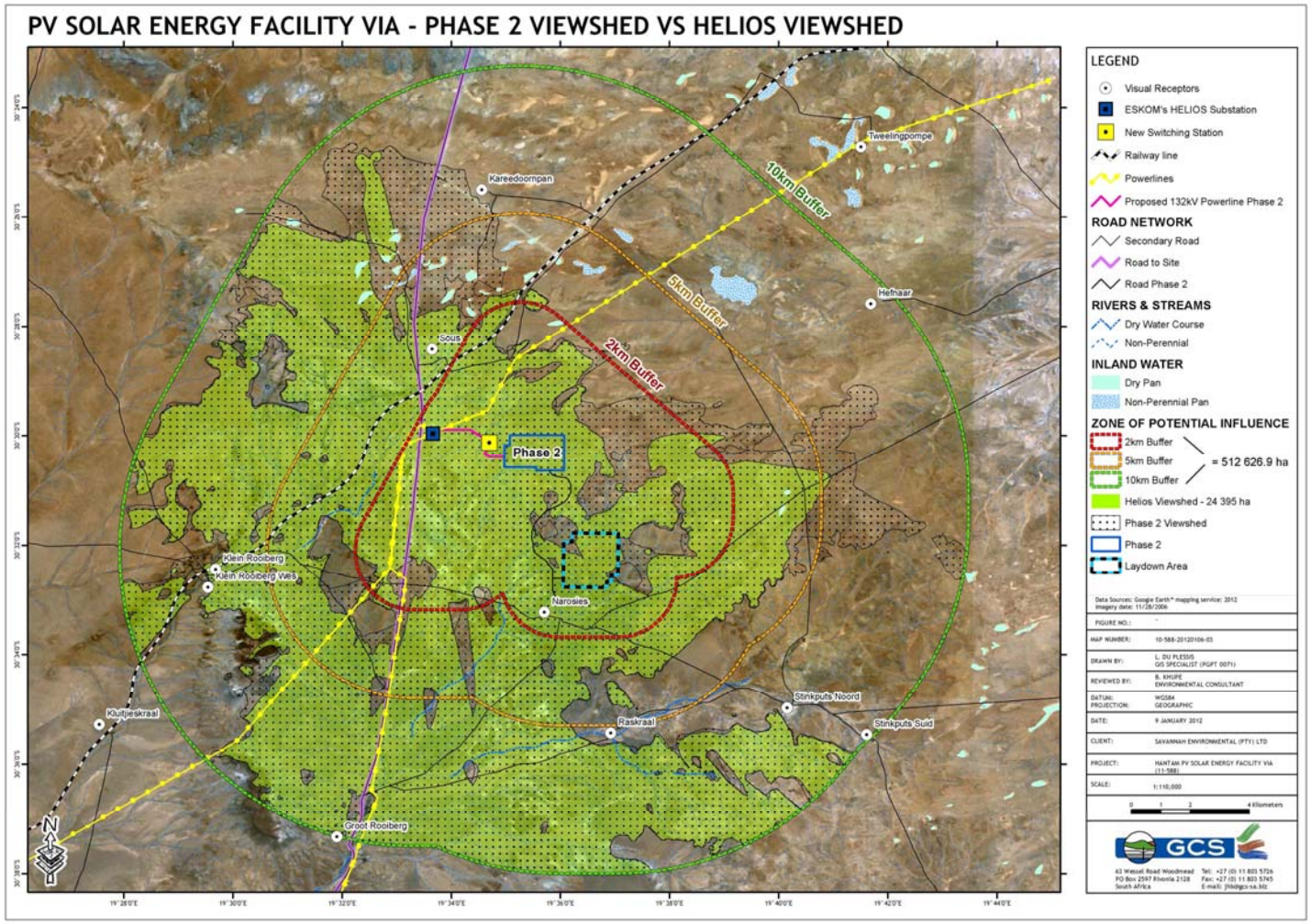

Figure 7.5: Potential visual exposure of the Hantam 2 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 2 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.
The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (45)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be moderate given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

7.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 2 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority

of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, Solar Capital should assist local BEE companies to complete and submit

the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be	

	eliminated	

***Mitigation*:**

- Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;
- Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;
- Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;
- The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;
- The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

- The size of the on-site construction camp should be kept as small as possible;
- The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;
- No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;
- Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;
- No non-mine workers should be allowed to spend the night at the construction camp;
- All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled;

» The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work

in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

- Solar Capital should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;

» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining livelihoods	Low (4)
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative

Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

***Cumulative impacts*:** None, provided losses are compensated for.

***Residual impacts*:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along

these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[14]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

[14] This assumes the establishment of some form of Community Trust

Nature: Promotion of clean, renewable energy		
	Without Mitigation	***With Mitigation*** *(The provision of renewable energy infrastructure is in itself a mitigation measure)*
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**High (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be enhanced?	Yes	
Enhancement: The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; » Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)

	(For job seekers that stay on the town)	(For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

- Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;
- Implement a policy that no employment will be available at the gate

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

Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related income.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed	Short term if damaged areas are

	areas are not effectively rehabilitated (5)	rehabilitated (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	

Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		

Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.
Residual impacts: See cumulative impacts

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 2 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

7.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[15]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 3 PV SOLAR ENERGY FACILITY: CHAPTER 8

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 3 PV Solar Energy Facility**, as well as for all of the facility's components. (Project development phases Hantam 4 to 7 are assessed in the chapters that follow).

The **Hantam 3 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» An onsite **substation**
» A new overhead distribution **power line** (approximately 2961 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 5919 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 3 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas,

transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

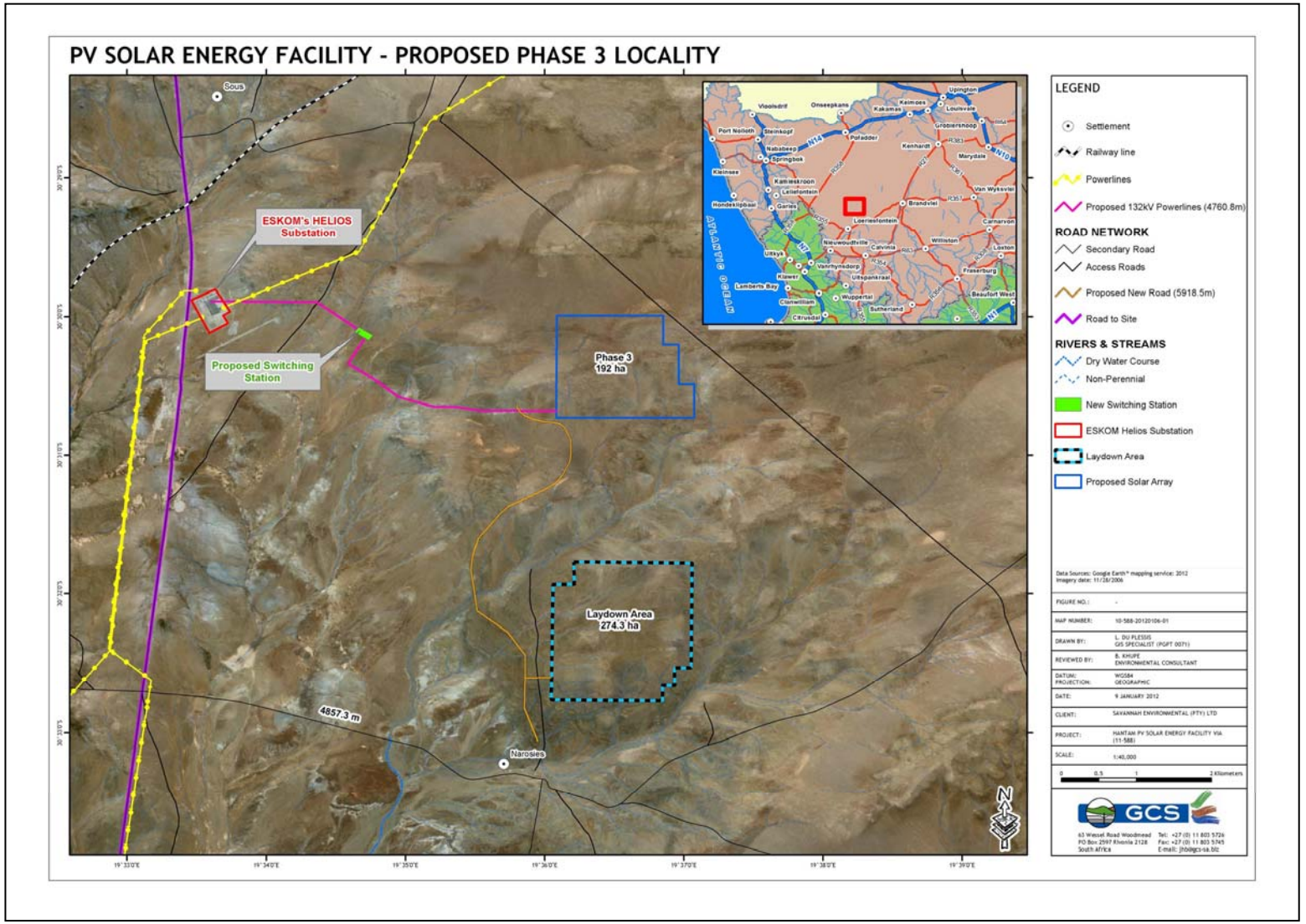

Figure 8.1: Preliminary layout of the proposed Hantam 3 PV Solar Energy Facility and associated infrastructure

8.1 Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[16].
» *Social and visual impacts* - from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 8.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[16] According to the National Water Act, these are classified as wetlands or water resources.

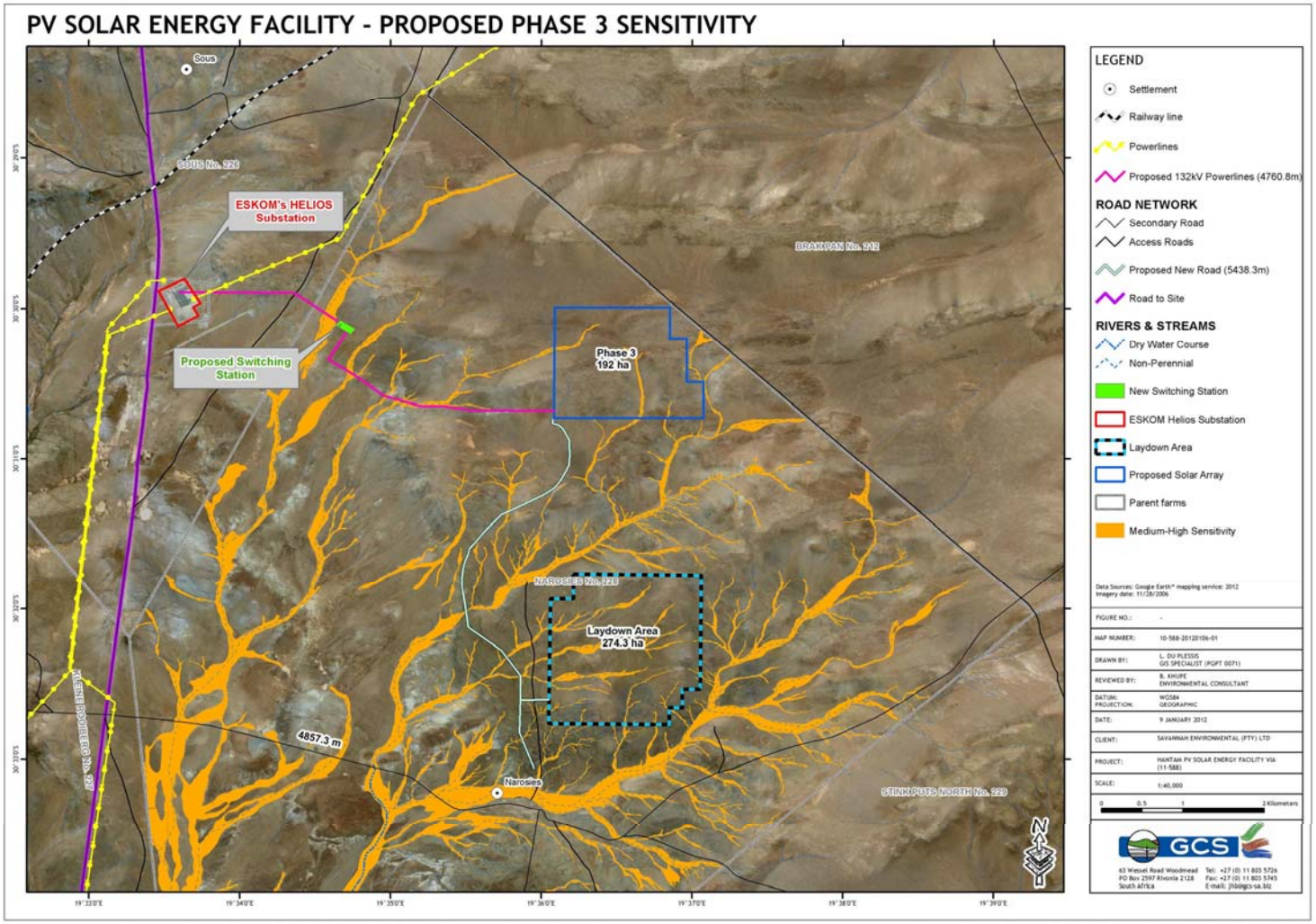

Figure 8.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

8.2 Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

8.3 Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 3 PV Solar facility. However, the development footprint will cover an area of approximately 193 ha in extent (for Hantam 3 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 8.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 3 PV Solar Energy Facility forms the third phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 3 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/3.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 3 PV Solar Energy Facility. The assessment of potential impacts associated with the other phases of the development (Hantam 4 to 7 PV Solar Energy Facility) is considered in Chapter 9 – 12 of this report respectively.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

8.4 Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 3 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 3 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	193
Distribution power line	3.8
Switching station	1
Substation	1
Access roads	2.96
TOTAL (ha)	(a total area of 201.7 ha of 6 764 ha) **~ 3 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

7.4.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**

Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts:		

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts: Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.

	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to Low (5)	Low (4)
Probability	definite (5)	Highly probable (4)

Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	To some degree	

mitigated?		
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: » Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared. » Avoid unnecessary impacts on natural vegetation surrounding the power line servitude. Impacts should be contained, as much as possible, within the footprint of the		

infrastructure.

» Service roads must be properly maintained to avoid erosion impacts.

Cumulative impacts:

Soil erosion may lead to additional loss of habitat that will exacerbate this impact.

Residual Impacts:

None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)

There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey

Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.		
Residual Impacts: Unlikely to be residual impacts.		

Nature: Bird collisions with power lines There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	
Mitigation: Devices to make lines more visible must be attached to overhead power lines.		
Cumulative impacts:		

None
Residual Impacts:
None likely

Nature: Damage to wetland areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses

	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

(7) Place tower structures a minimum of 50 m from watercourses.
(8) Service roads in the servitude must be properly maintained to avoid erosion impacts.
(9) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)

Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

8.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.

Cumulative Impacts:

» The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.

Residual Impacts:

» None

Nature: disturbance of soils and impacts on existing land use due to construction of roads

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)

Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site

This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.

	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit vehicle movement to absolute minimum, construct appropriate roads for access.

Cumulative Impacts:

» The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.

Residual Impacts:

» None

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No

Mitigation*:*

The loss of agricultural land is a long-term loss and there are no mitigation measures that can be put in place to combat this loss. In the case of low agriculture potential, soil impacts

can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

8.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	Yes	
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

8.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 8.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

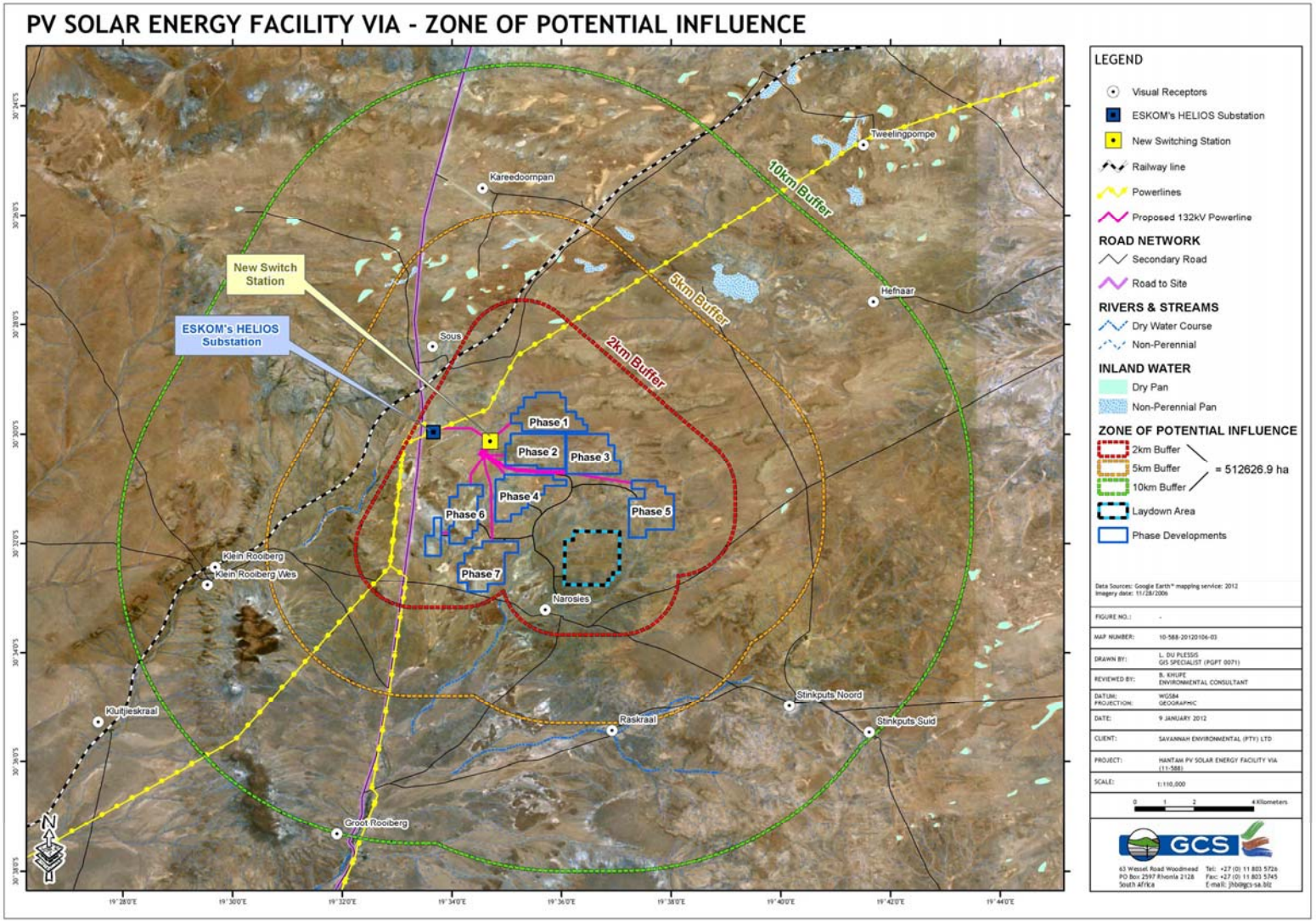

Figure 8.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 8.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 8.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in extent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 64.7 % of the zone of influence. However, the viewshed of the facility has a 72.7 % overlap with the viewshed of the existing Helios Substation. The Hantam 3 PV facility will be potentially visible to the following 6 homesteads/settlements:

- *Sous,*
- *Hefnaar*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*

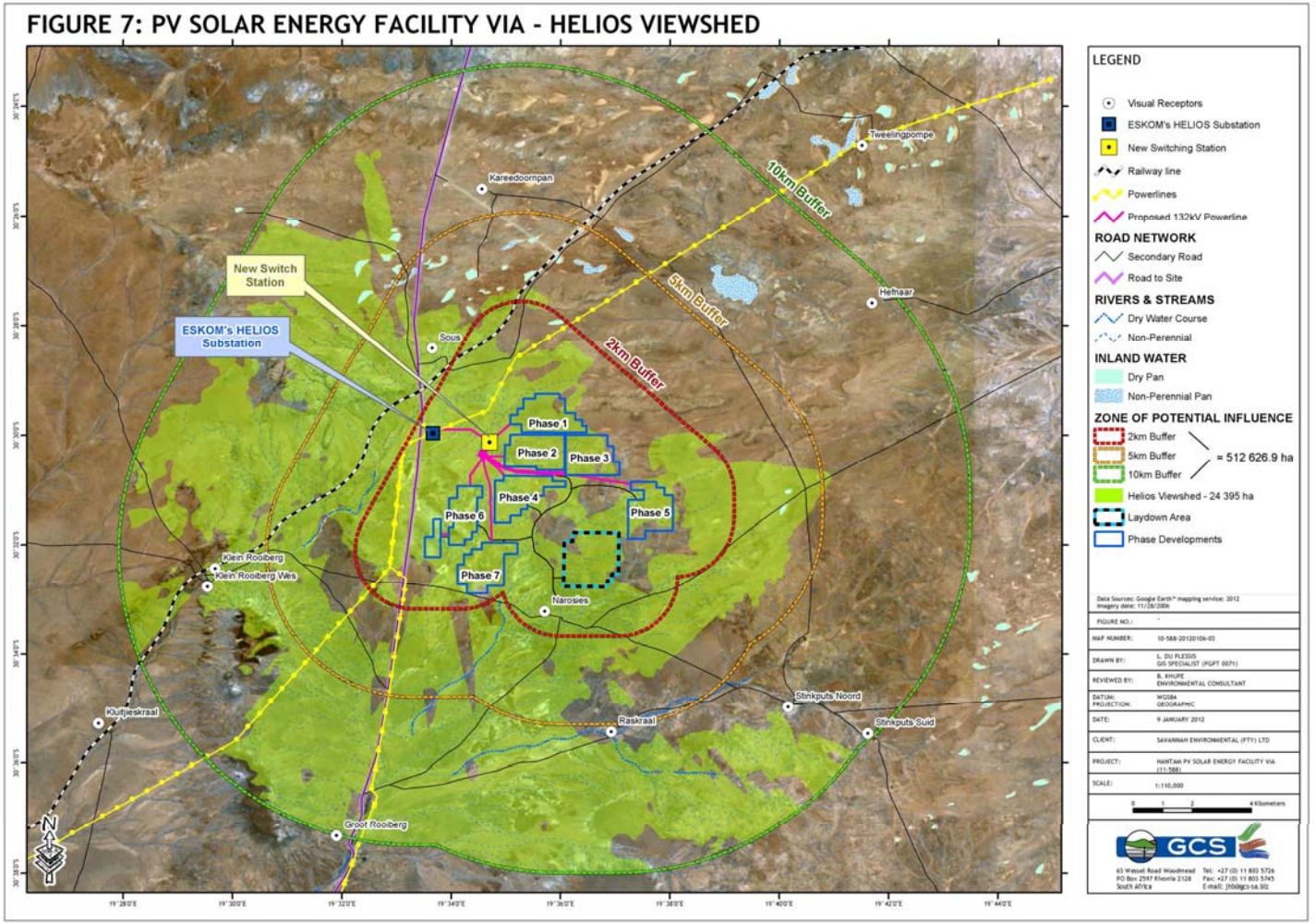

Figure 8.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

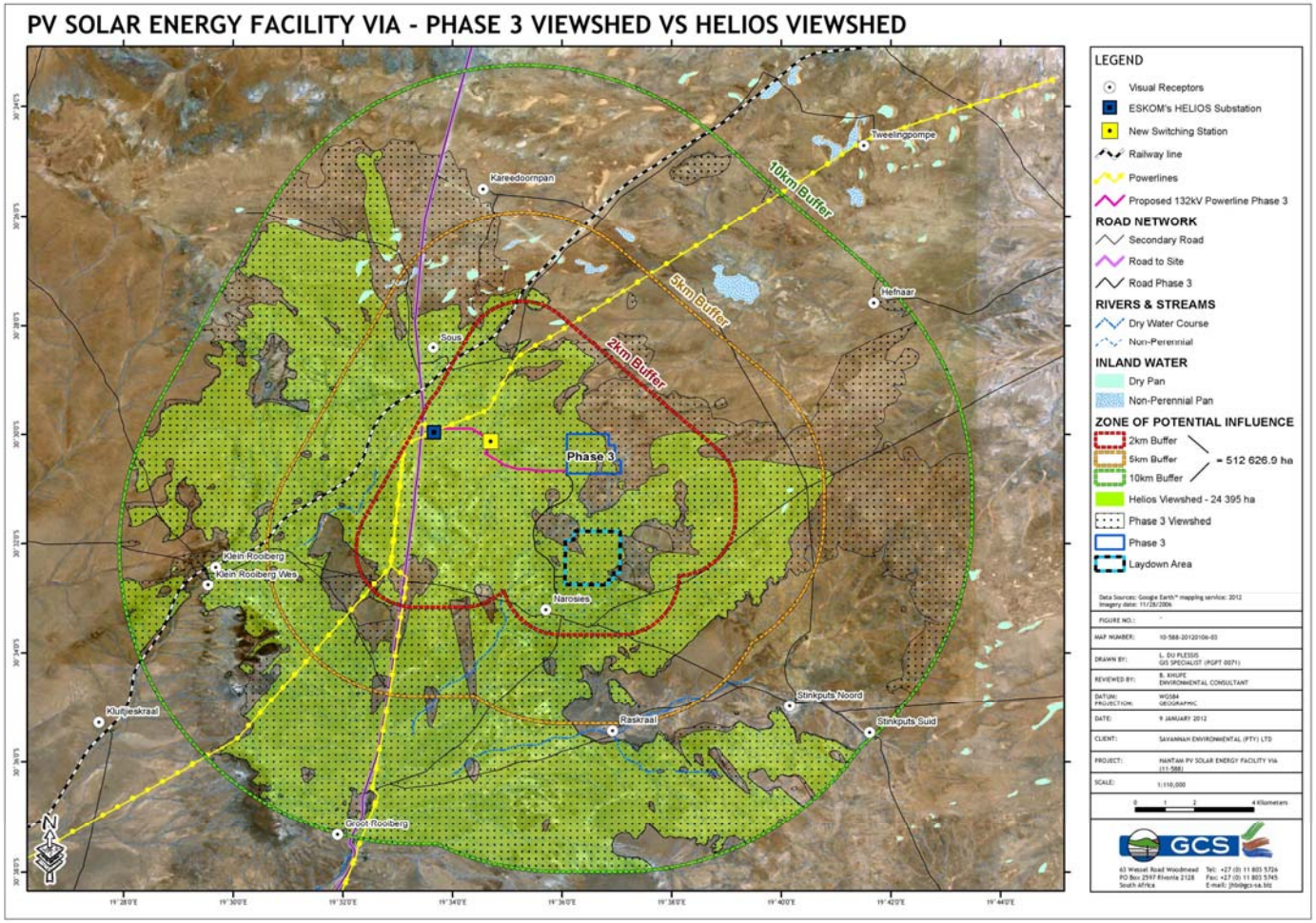

Figure 8.5: Potential visual exposure of the Hantam 3 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 3 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.

The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (45)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be moderate given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

8.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 3 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority

of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, Solar Capital should assist local BEE companies to complete and submit

the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be	

	eliminated	

***Mitigation*:**

» Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;

» Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;

» Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;

» Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;

» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;

» The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;

» The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;

» It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

» The size of the on-site construction camp should be kept as small as possible;

» The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;

» No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;

» Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;

» No non-mine workers should be allowed to spend the night at the construction camp;

» All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled;

» The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work

in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

- Solar Capital should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;

» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining livelihoods	Low (4)
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative

Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts**:** None, provided losses are compensated for.

Residual impacts**:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along

these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[17]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

[17] This assumes the establishment of some form of Community Trust

Nature: Promotion of clean, renewable energy		
	Without Mitigation	***With Mitigation*** *(The provision of renewable energy infrastructure is in itself a mitigation measure)*
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**High (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be enhanced?	Yes	
Enhancement: The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; » Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)

	(For job seekers that stay on the town)	(For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

- Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;
- Implement a policy that no employment will be available at the gate

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

Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional(3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related income.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)

Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

Nature: Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.
The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	

Enhancement: The recommendations contained in the VIA should be implemented.
Cumulative impacts: Potential impact on current rural sense of place
Residual impacts: See cumulative impacts

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement: The recommendations contained in the VIA should be implemented.
Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.
Residual impacts: See cumulative impacts

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 3 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

8.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[18]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 4 PV SOLAR ENERGY FACILITY: CHAPTER 9

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 4 PV Solar Energy Facility**, as well as for all of the facility's components. (Project development phases Hantam 5 to 7 are assessed in the chapters that follow).

The **Hantam 4 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» An onsite **substation**
» A new overhead distribution **power line** (approximately 1449 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 4124 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 4 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas,

transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

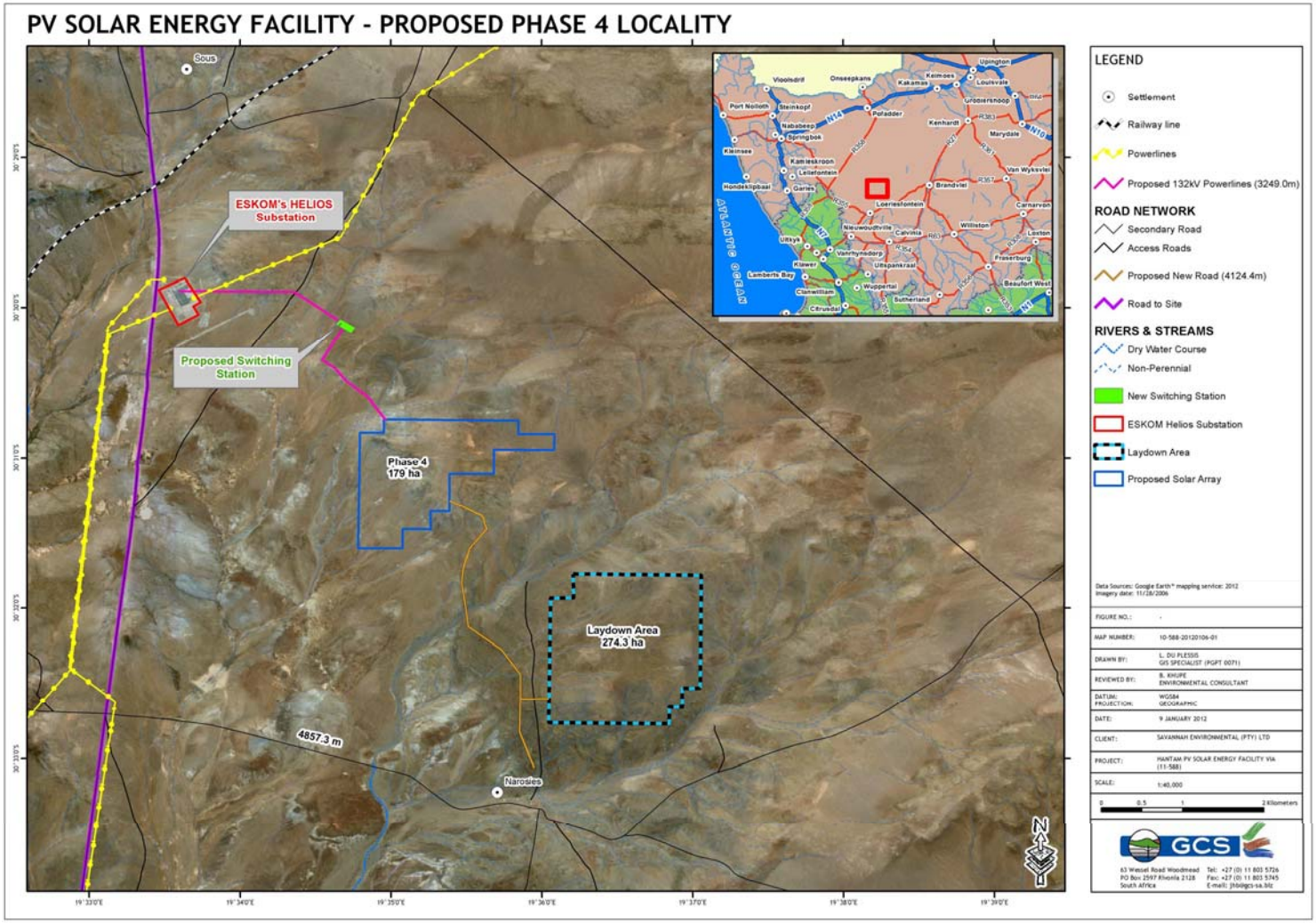

Figure 9.1: Preliminary layout of the proposed Hantam 4 PV Solar Energy Facility and associated infrastructure

9.1 Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[19].
» *Social and visual impacts* - from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 9.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[19] According to the National Water Act, these are classified as wetlands or water resources.

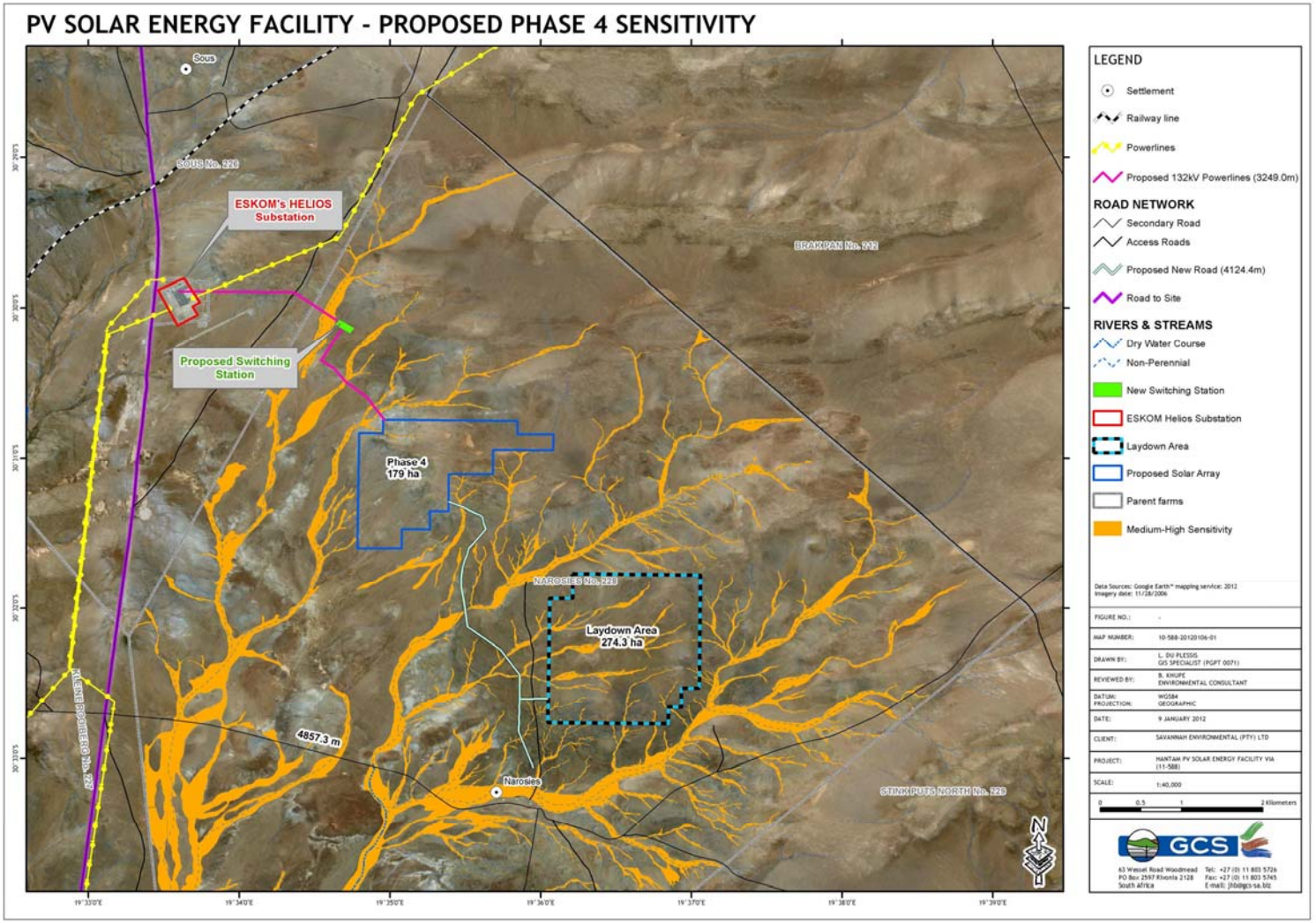

Figure 9.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

9.2 Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

9.3 Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 4 PV Solar facility. However, the development footprint will cover an area of approximately 180 ha in extent (for Hantam 4 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 9.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 4 PV Solar Energy Facility forms the fourth phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 4 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/4.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 4 PV Solar Energy Facility. The assessment of potential impacts associated with the other phases of the development (Hantam 5 to 7 PV Solar Energy Facility) is considered in Chapter 9 – 12 of this report respectively.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

9.4 Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 4 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 4 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	180
Distribution power line	2.6
Switching station	1
Substation	1
Access roads	2.1
TOTAL (ha)	(a total area of 186.7 ha of 6 764 ha) **~ 2.8 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

9.4.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**

Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts:		

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts: Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.

	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to Low (5)	Low (4)

Probability	definite (5)	Highly probable (4)
Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	

Mitigation:
» Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared.
» Avoid unnecessary impacts on natural vegetation surrounding the power line servitude.

Impacts should be contained, as much as possible, within the footprint of the infrastructure. » Service roads must be properly maintained to avoid erosion impacts.
Cumulative impacts: Soil erosion may lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts: None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)

There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon,

Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:
Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.

Cumulative impacts:
Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:
Unlikely to be residual impacts.

Nature: Bird collisions with power lines
There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:
Devices to make lines more visible must be attached to overhead power lines.

Cumulative impacts: None
Residual Impacts: None likely

Nature: Damage to wetland areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses

	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

(10) Place tower structures a minimum of 50 m from watercourses.

(11) Service roads in the servitude must be properly maintained to avoid erosion impacts.

(12) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica, Opuntia imbricata, Prosopis glandulosa, Prosopis velutina, Atriplex numularia,* and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)

Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

9.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.

Cumulative Impacts:

» The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.

Residual Impacts:

» None

Nature: disturbance of soils and impacts on existing land use due to construction of roads

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)

Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Limit vehicle movement to absolute minimum, construct appropriate roads for access.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.		
Residual Impacts: » None		

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).		
	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No
Mitigation*:* The loss of agricultural land is a long-term loss and there are no mitigation measures that		

can be put in place to combat this loss. In the case of low agriculture potential, soil impacts can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

9.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of	Yes	Yes

resources?		
Can impacts be mitigated?	Yes	
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

9.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 9.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

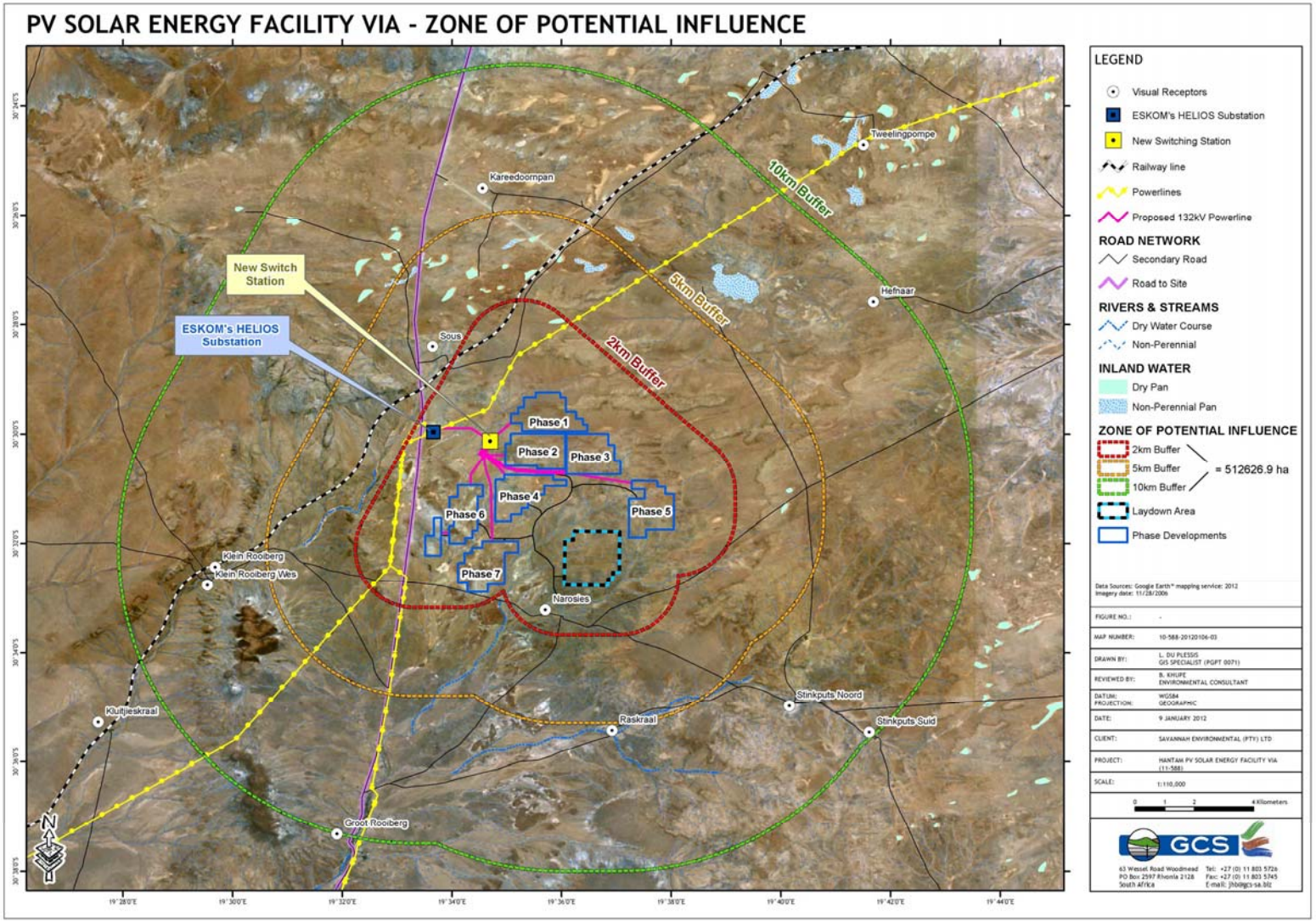

Figure 9.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 9.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 9.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in extent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 58.2 % of the zone of influence. However, the viewshed of the facility has a 80.9% overlap with the viewshed of the existing Helios Substation. The Hantam 4 PV facility will be potentially visible to the following 5 homesteads/settlements:

- *Sous,*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*

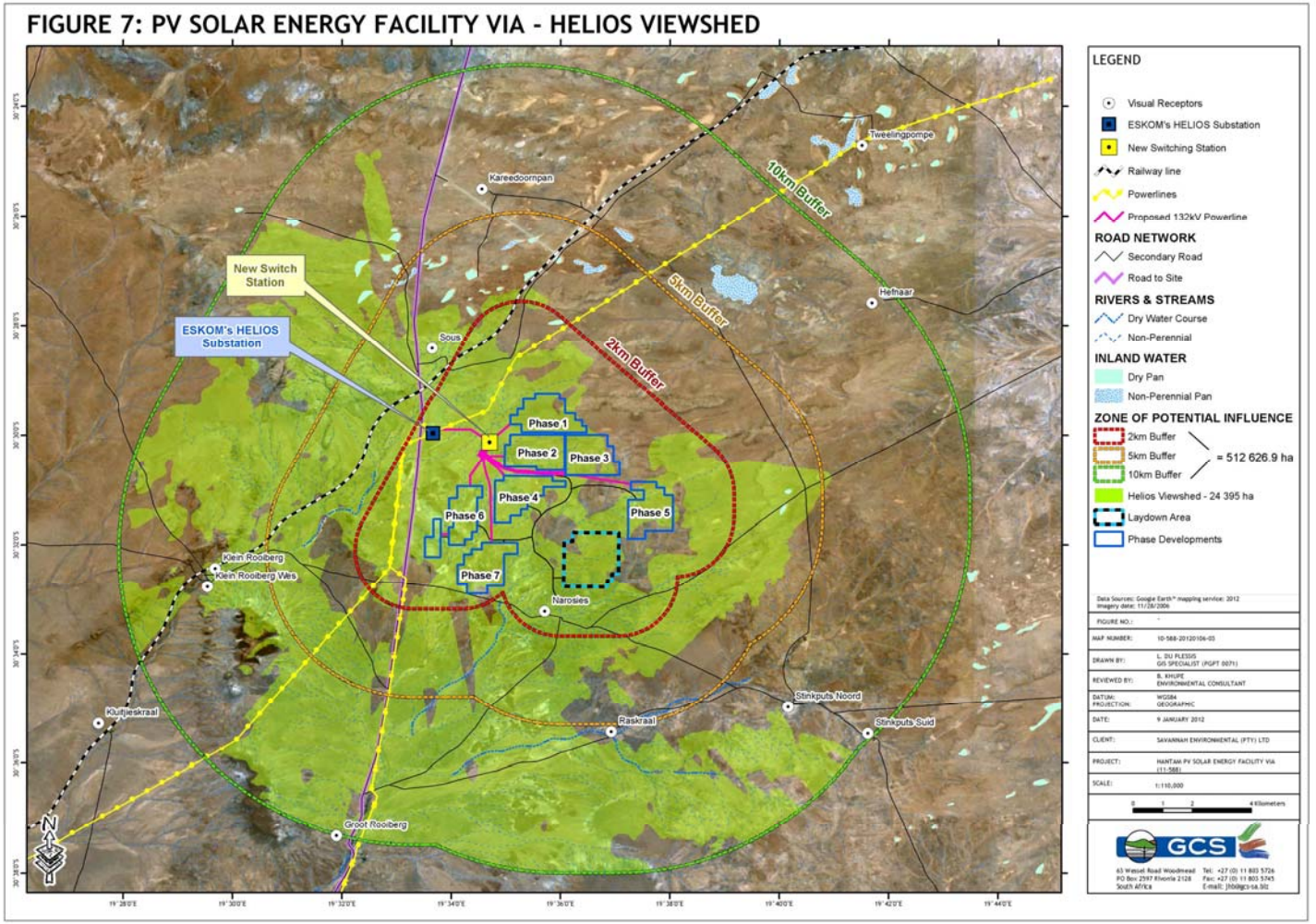

Figure 9.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

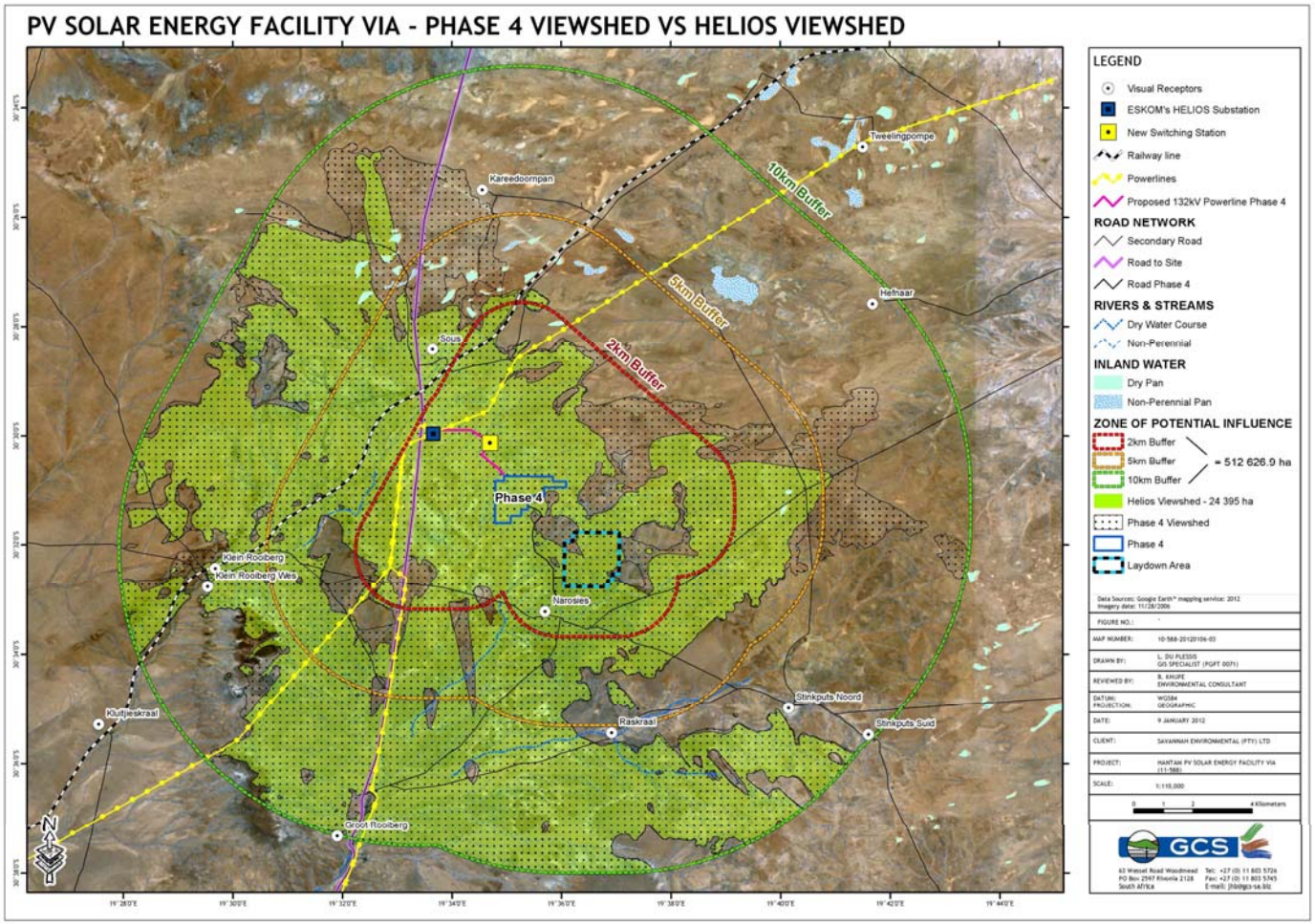

Figure 9.5: Potential visual exposure of the Hantam 4 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 4 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.
The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (45)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be moderate given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

9.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 4 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority

of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, Solar Capital should assist local BEE companies to complete and submit

the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be	

	eliminated	

***Mitigation*:**

- Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;
- Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;
- Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;
- The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;
- The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

- The size of the on-site construction camp should be kept as small as possible;
- The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;
- No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;
- Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;
- No non-mine workers should be allowed to spend the night at the construction camp;
- All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled;

» The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work

in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

- » Solar Capital should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- » Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;

» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining livelihoods	Low (4)
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative

Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts**:** None, provided losses are compensated for.

Residual impacts**:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along

these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[20]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

[20] This assumes the establishment of some form of Community Trust

Nature: Promotion of clean, renewable energy		
	Without Mitigation	***With Mitigation*** *(The provision of renewable energy infrastructure is in itself a mitigation measure)*
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**High (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be enhanced?	Yes	
Enhancement: The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; » Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)

	(For job seekers that stay on the town)	(For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

- Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;
- Implement a policy that no employment will be available at the gate

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

Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related income.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)

Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	

Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		

Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.
Residual impacts: See cumulative impacts

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 4 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

9.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[21]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 5 PV SOLAR ENERGY FACILITY: CHAPTER 10

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 5 PV Solar Energy Facility**, as well as for all of the facility's components. (Project development phases Hantam 6 to 7 are assessed in the chapters that follow).

The **Hantam 5 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» An onsite **substation**
» A new overhead distribution **power line** (approximately 4993 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 7001 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 5 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas,

transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

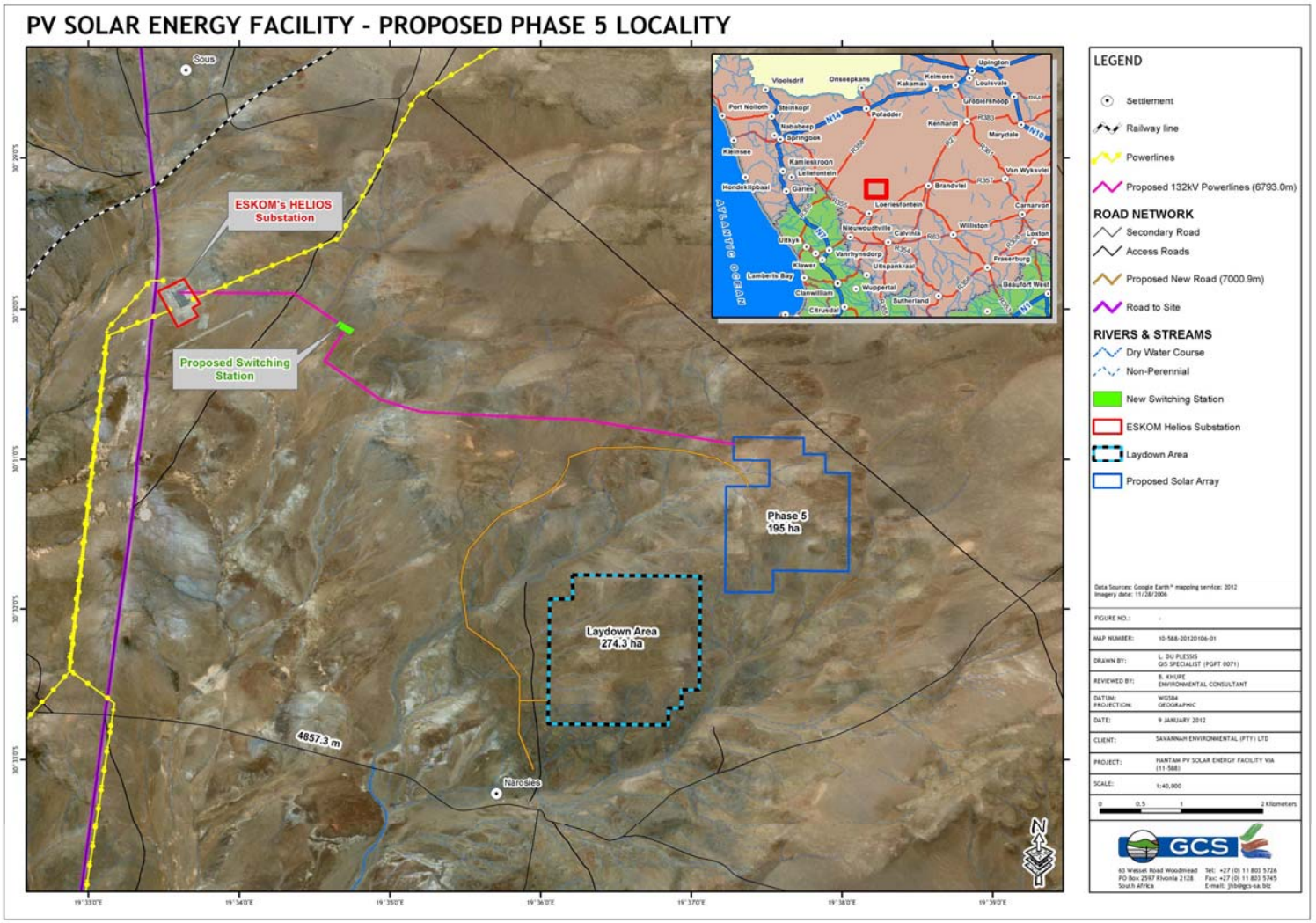

Figure 10.1: Preliminary layout of the proposed Hantam 5 PV Solar Energy Facility and associated infrastructure

10.1 Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[22].
» *Social and visual impacts* **-** from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 10.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[22] According to the National Water Act, these are classified as wetlands or water resources.

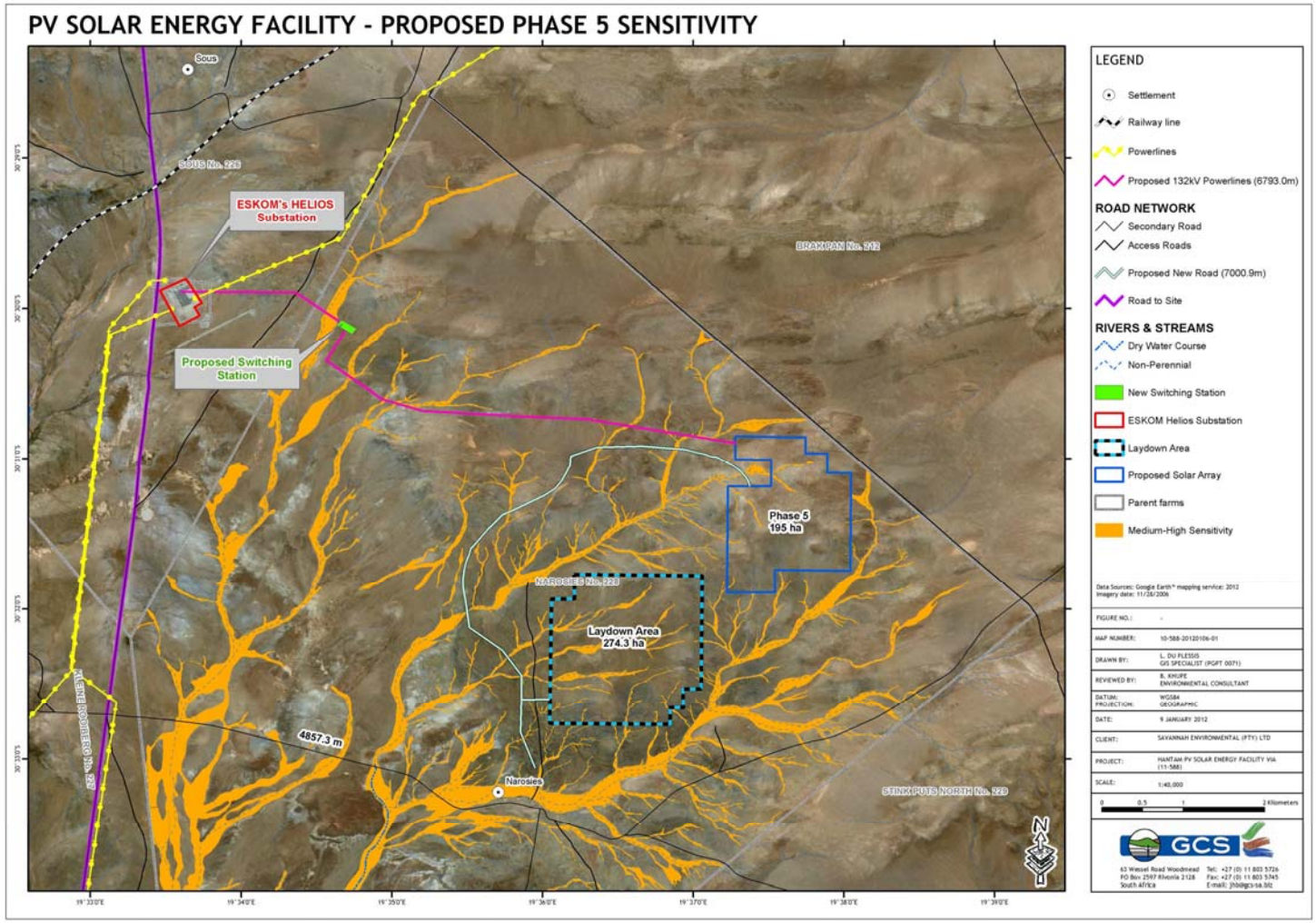

Figure 10.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

10.2 Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

10.3 Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 5 PV Solar facility. However, the development footprint will cover an area of approximately 195 ha in extent (for Hantam 5 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 10.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 5 PV Solar Energy Facility forms the fifth phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 5 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/5.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 5 PV Solar Energy Facility. The assessment of potential impacts associated with the other phases of the development (Hantam 6 to 7 PV Solar Energy Facility) is considered in Chapter 11 – 12 of this report respectively.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

10.4 Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 5 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 5 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	195
Distribution power line	5.4
Switching station	1
Substation	1
Access roads	3.5
TOTAL (ha)	(a total area of 205.9 ha of 6 764 ha) **~ 3 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

10.4.1Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**

Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts:		

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts: Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.

	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to Low (5)	Low (4)
Probability	definite (5)	Highly probable (4)

Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	To some degree	

mitigated?		
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: » Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared. » Avoid unnecessary impacts on natural vegetation surrounding the power line servitude. Impacts should be contained, as much as possible, within the footprint of the		

infrastructure. » Service roads must be properly maintained to avoid erosion impacts.
Cumulative impacts: Soil erosion may lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts: None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)

There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey

Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.		
Residual Impacts: Unlikely to be residual impacts.		

Nature: Bird collisions with power lines There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	
Mitigation: Devices to make lines more visible must be attached to overhead power lines.		
Cumulative impacts:		

None
Residual Impacts: None likely

Nature: Damage to wetland areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses

	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

(13) Place tower structures a minimum of 50 m from watercourses.

(14) Service roads in the servitude must be properly maintained to avoid erosion impacts.

(15) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**

Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

10.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The

grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.

Cumulative Impacts:

» The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.

Residual Impacts:

» None

Nature: disturbance of soils and impacts on existing land use due to construction of roads

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***

Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site

This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.

	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit vehicle movement to absolute minimum, construct appropriate roads for access.

Cumulative Impacts:

» The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.

Residual Impacts:

» None

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No

Mitigation*:*

The loss of agricultural land is a long-term loss and there are no mitigation measures that can be put in place to combat this loss. In the case of low agriculture potential, soil impacts

can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

10.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	Yes	

mitigated?		
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

10.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 10.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

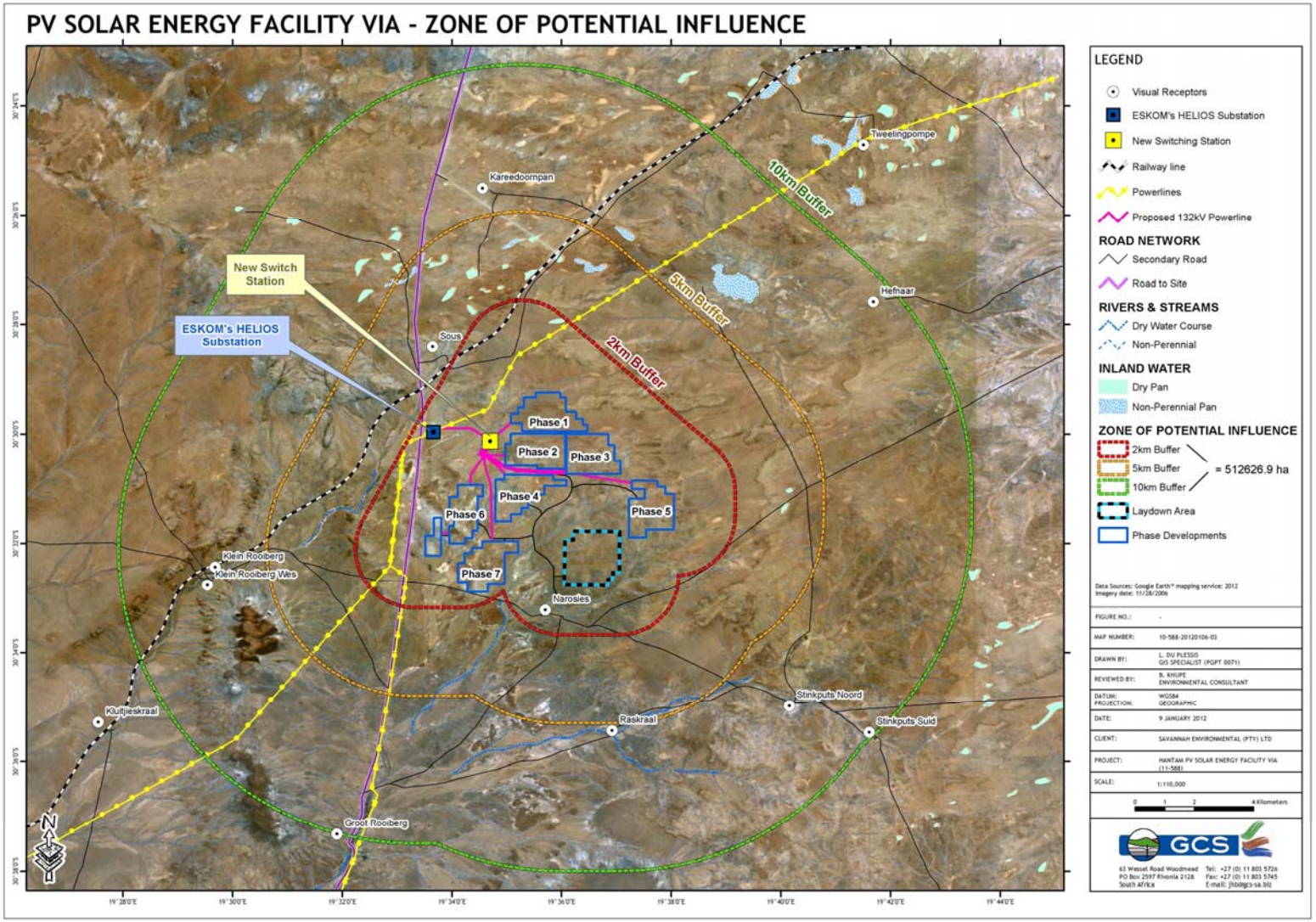

Figure 10.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 10.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 10.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in extent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 67.2 % of the zone of influence. However, the viewshed of the facility has a 70.1% overlap with the viewshed of the existing Helios Substation. The Hantam 5 PV facility will be potentially visible to the following 5 homesteads/settlements:

- *Sous,*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*
- *Hefnaar*

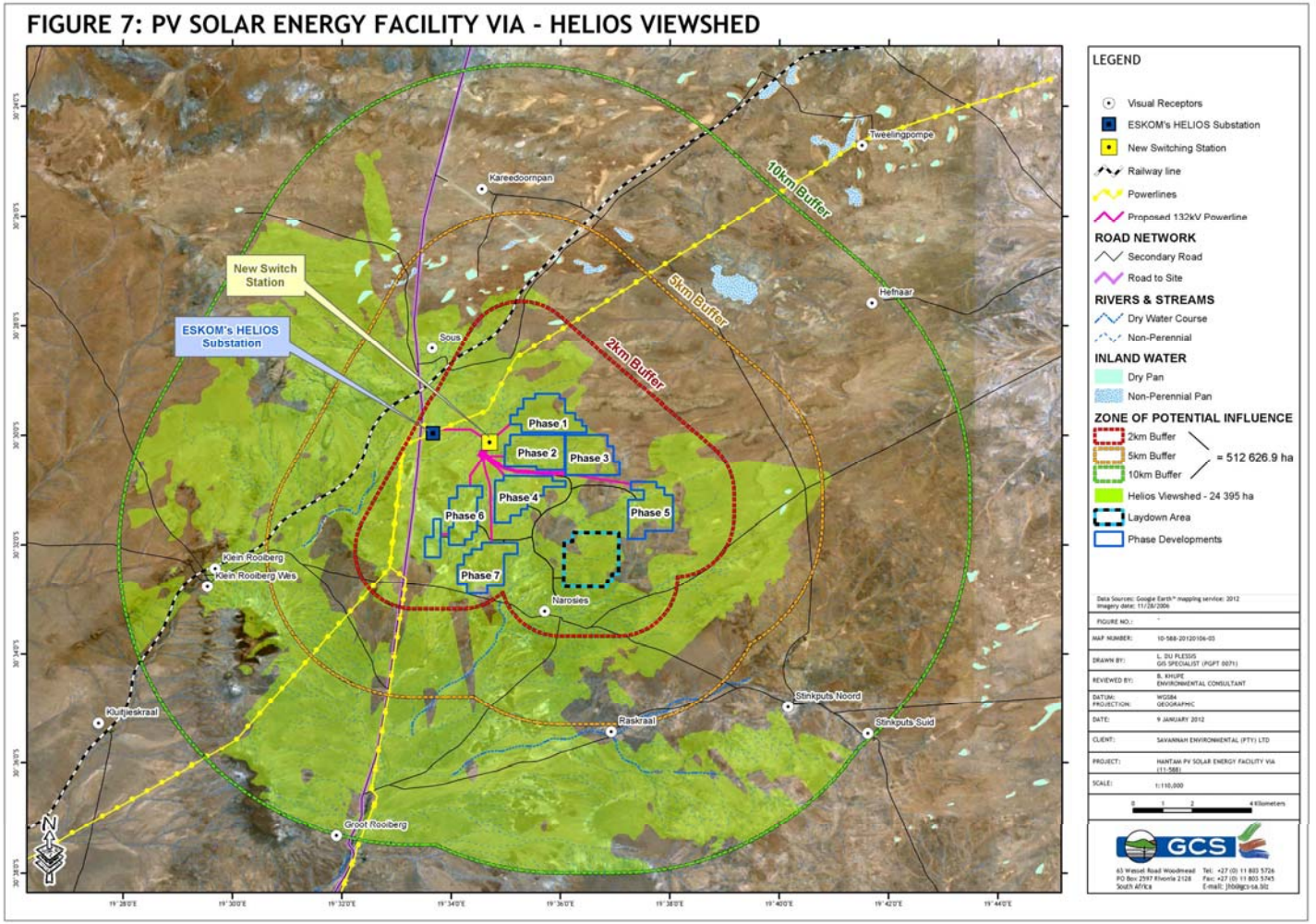

Figure 10.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

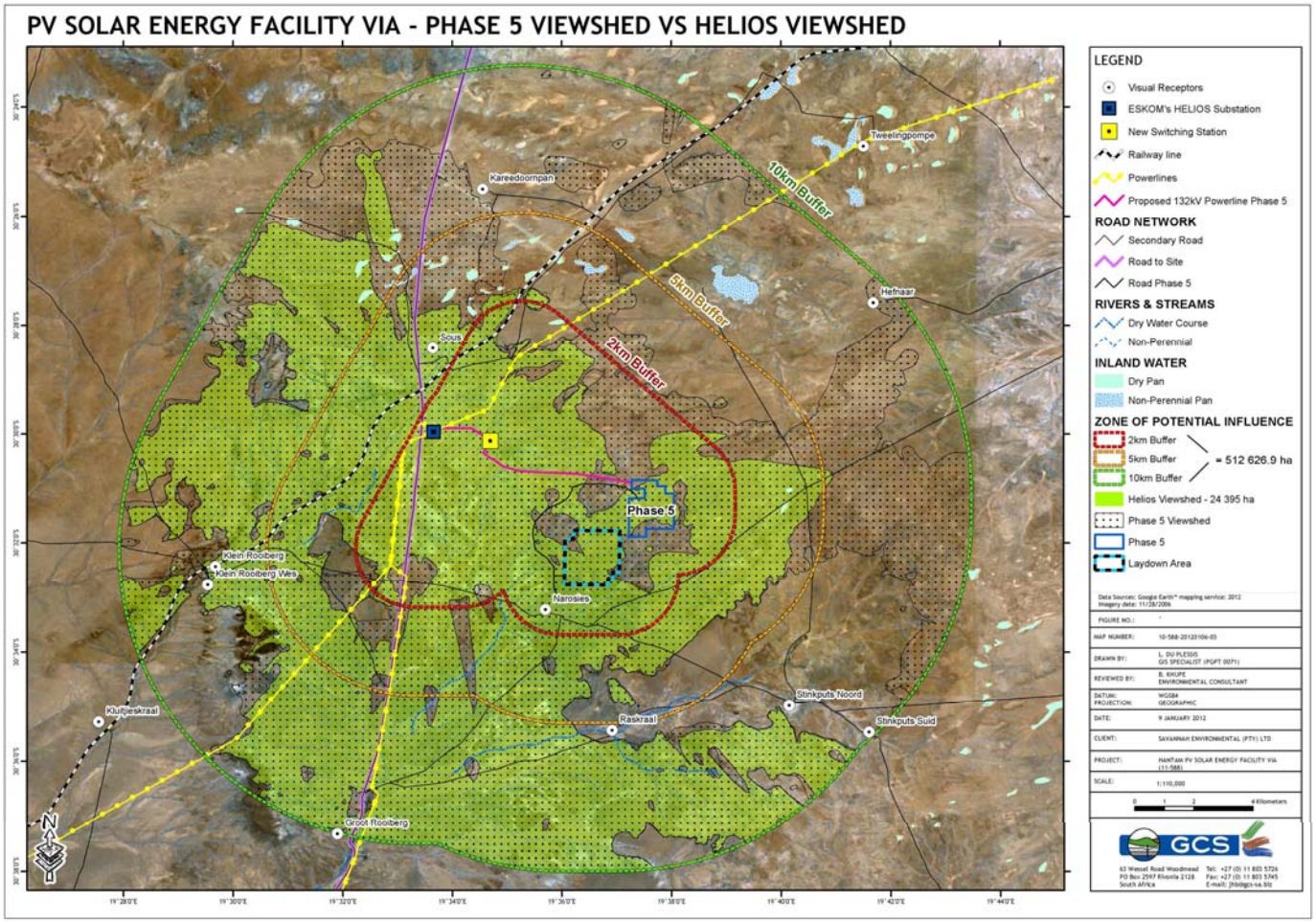

Figure 10.5: Potential visual exposure of the Hantam 5 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 5 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.
The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (50)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be moderate given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

10.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 5 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority

of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, Solar Capital should assist local BEE companies to complete and submit

the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be	

	eliminated	

***Mitigation*:**

» Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;

» Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;

» Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;

» Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;

» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;

» The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;

» The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;

» It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

» The size of the on-site construction camp should be kept as small as possible;

» The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;

» No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;

» Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;

» No non-mine workers should be allowed to spend the night at the construction camp;

» All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled;

» The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work

in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

- Solar Capital should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;

» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining livelihoods	Low (4)
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative

Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

***Cumulative impacts*:** None, provided losses are compensated for.

***Residual impacts*:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along

these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[23]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

[23] This assumes the establishment of some form of Community Trust

Nature: Promotion of clean, renewable energy		
	Without Mitigation	***With Mitigation*** *(The provision of renewable energy infrastructure is in itself a mitigation measure)*
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**High (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be enhanced?	Yes	
Enhancement: The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; » Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)

	(For job seekers that stay on the town)	(For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

- Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;
- Implement a policy that no employment will be available at the gate

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

Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related income.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)

Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	

Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		

Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.
Residual impacts: See cumulative impacts

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 5 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

10.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[24]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 6 PV SOLAR ENERGY FACILITY: CHAPTER 11

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 6 PV Solar Energy Facility**, as well as for all of the facility's components. (Project development phase Hantam 7 is assessed in the chapter that follows).

The **Hantam 6 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» An onsite **substation**
» A new overhead distribution **power line** (approximately 1971 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 4926 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 6 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas,

transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

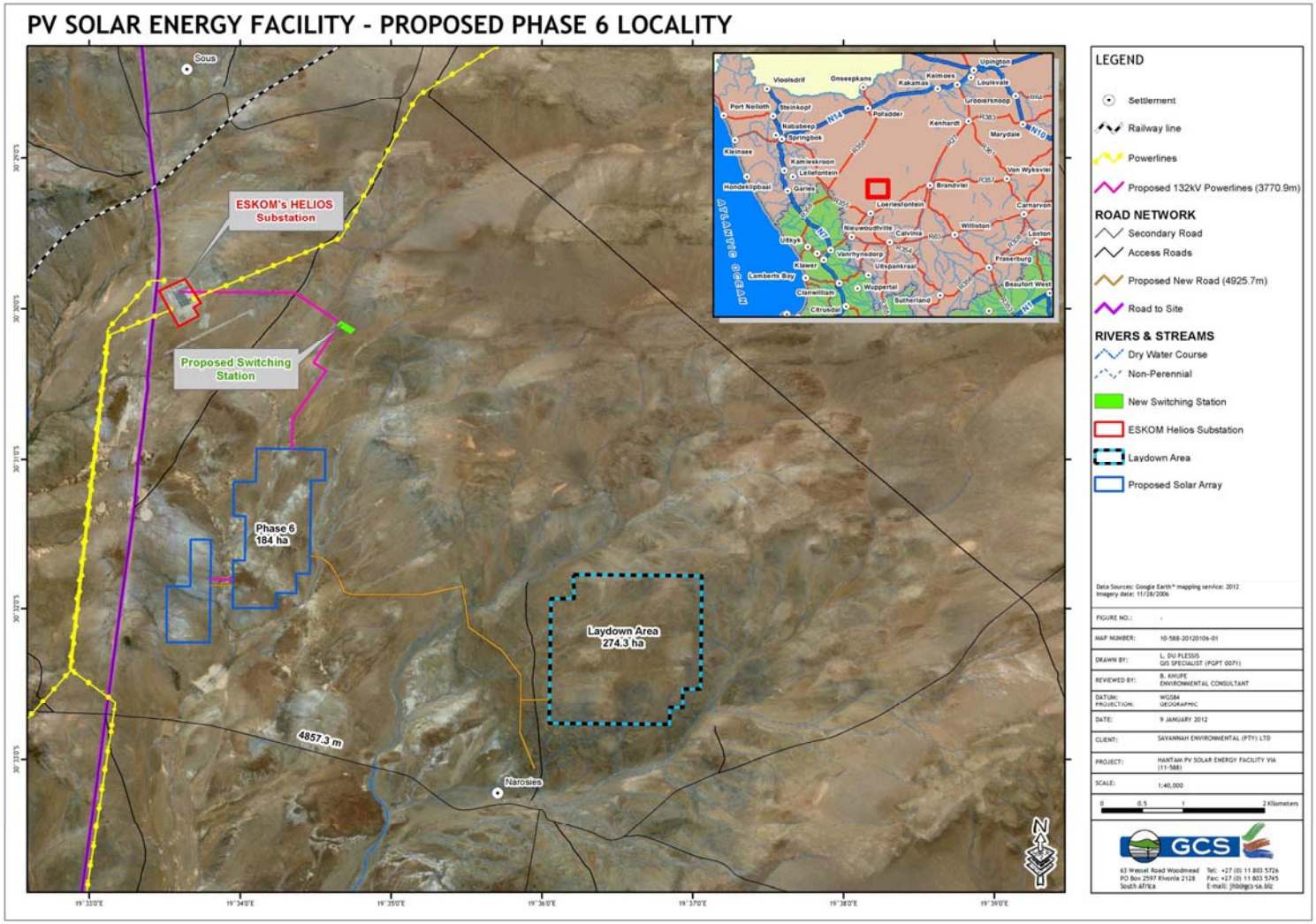

Figure 11.1: Preliminary layout of the proposed Hantam 6 PV Solar Energy Facility and associated infrastructure

11.1 Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[25].
» *Social and visual impacts* **-** from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 11.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[25] According to the National Water Act, these are classified as wetlands or water resources.

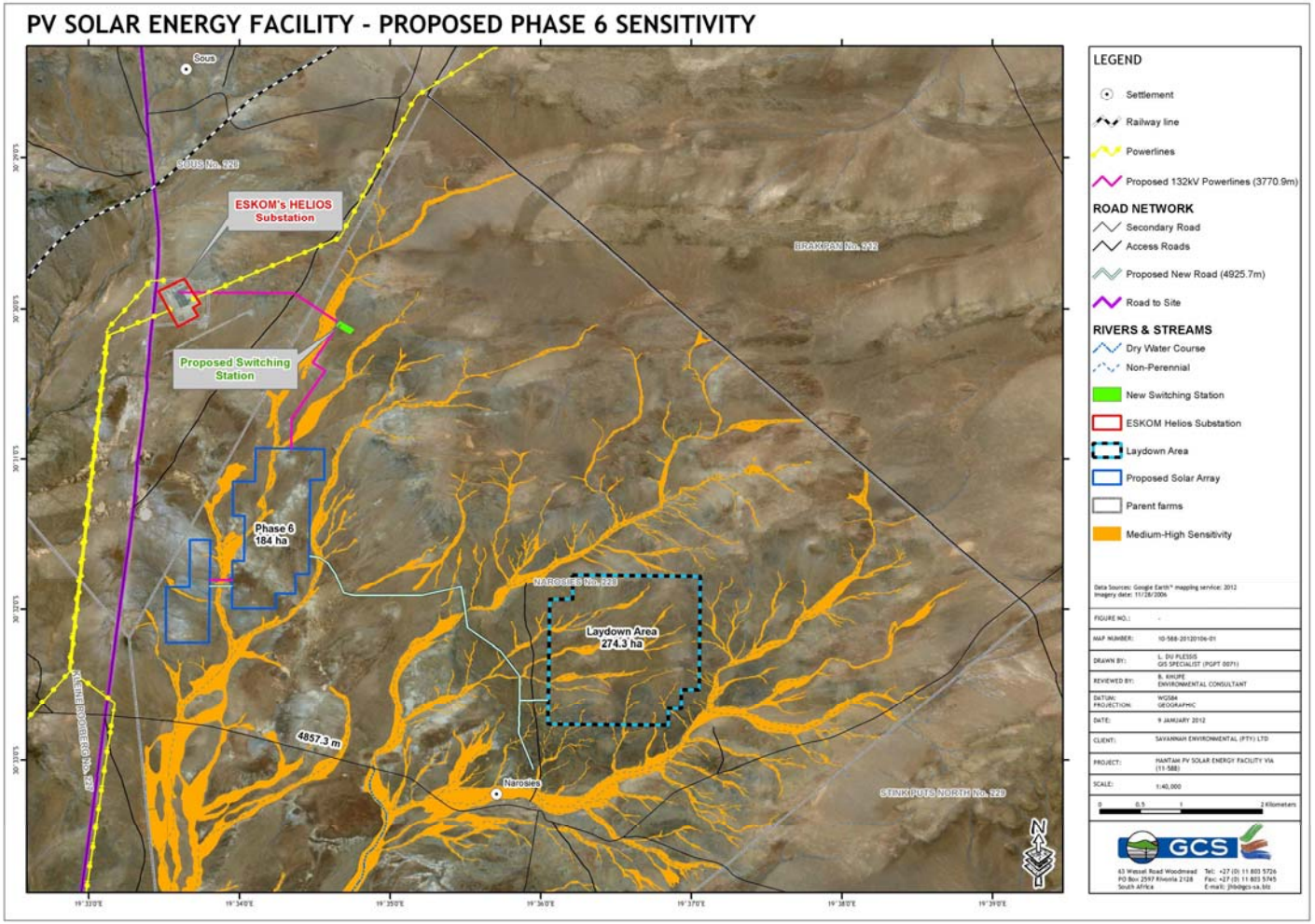

Figure 11.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

11.2 Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

11.3 Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 6 PV Solar facility. However, the development footprint will cover an area of approximately 184 ha in extent (for Hantam 6 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 11.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 6 PV Solar Energy Facility forms the fifth phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 6 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/6.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 6 PV Solar Energy Facility. The assessment of potential impacts associated with the other phases of the development (Hantam 7 PV Solar Energy Facility) is considered in Chapter 11 – 12 of this report respectively.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

11.4 Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 6 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 6 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	195
Distribution power line	4.3
Switching station	1
Substation	1
Access roads	1.7
TOTAL (ha)	(a total area of 203 ha of 6 764 ha) **~ 3 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

10.4.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**

Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts:		

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts: Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.		
Residual Impacts: Unlikely to be residual impacts.		

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.		
	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to Low (5)	Low (4)

Probability	definite (5)	Highly probable (4)
Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	

Mitigation:
» Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared.
» Avoid unnecessary impacts on natural vegetation surrounding the power line servitude.

Impacts should be contained, as much as possible, within the footprint of the infrastructure. » Service roads must be properly maintained to avoid erosion impacts.
Cumulative impacts: Soil erosion may lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts: None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)		
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.		
Residual Impacts: Unlikely to be residual impacts.		

Nature: Impacts on individuals of threatened animal species
There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon,

Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:
Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.

Cumulative impacts:
Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:
Unlikely to be residual impacts.

Nature: Bird collisions with power lines
There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:
Devices to make lines more visible must be attached to overhead power lines.

Cumulative impacts:
None
Residual Impacts:
None likely

Nature: Damage to wetland areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses

	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

(16) Place tower structures a minimum of 50 m from watercourses.

(17) Service roads in the servitude must be properly maintained to avoid erosion impacts.

(18) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

10.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The

grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: disturbance of soils and impacts on existing land use due to construction of roads The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.		
	Without mitigation	***With mitigation***

Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site

This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.

	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit vehicle movement to absolute minimum, construct appropriate roads for access.

Cumulative Impacts:

» The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.

Residual Impacts:

» None

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No

Mitigation*:*

The loss of agricultural land is a long-term loss and there are no mitigation measures that can be put in place to combat this loss. In the case of low agriculture potential, soil impacts

can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

10.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	Yes	

mitigated?		
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

10.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 10.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

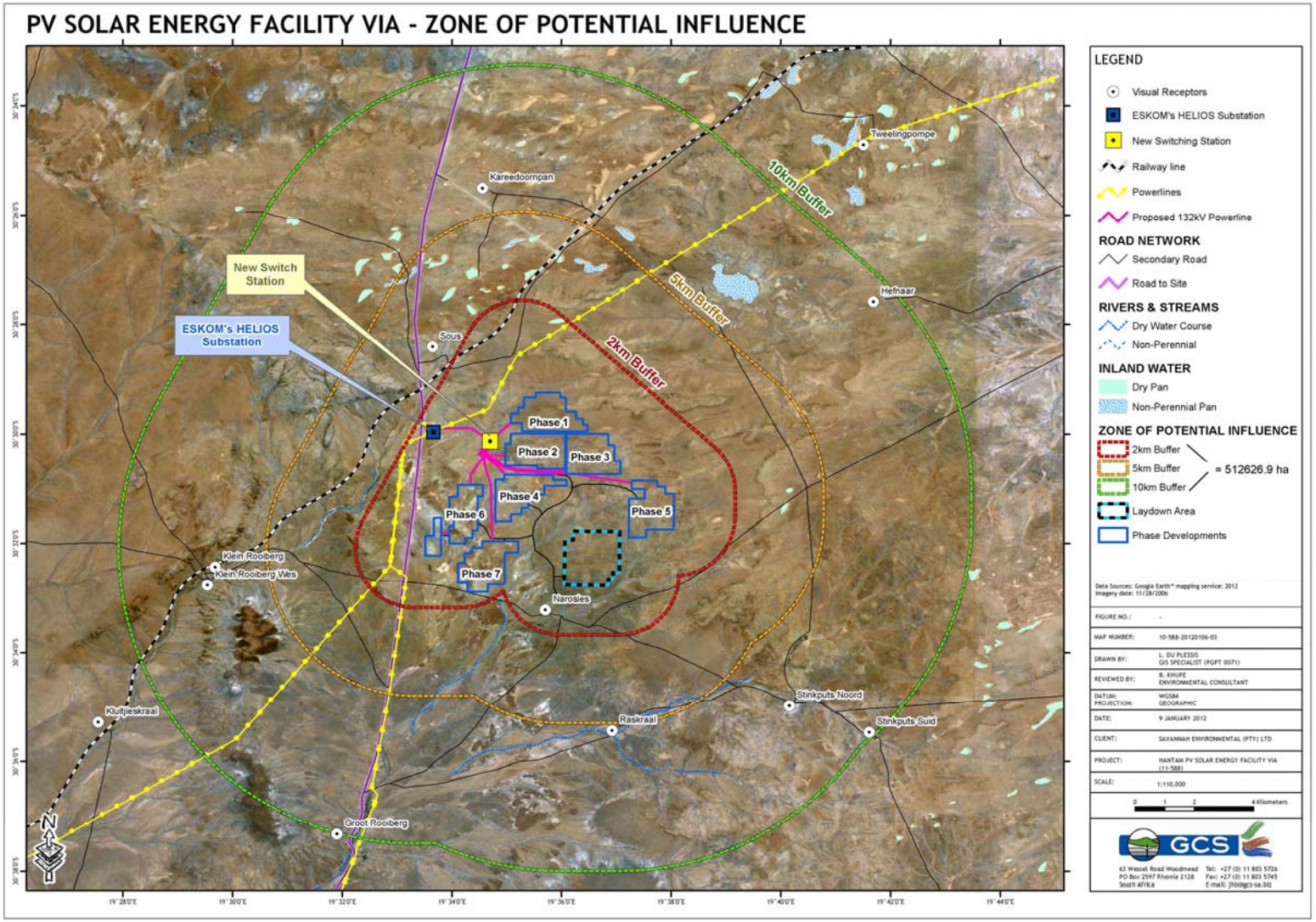

Figure 11.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 11.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 11.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in extent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 58.7 % of the zone of influence. However, the viewshed of the facility has a 80.2% overlap with the viewshed of the existing Helios Substation. The Hantam 6 PV facility will be potentially visible to the following 5 homesteads/settlements:

- *Sous,*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*

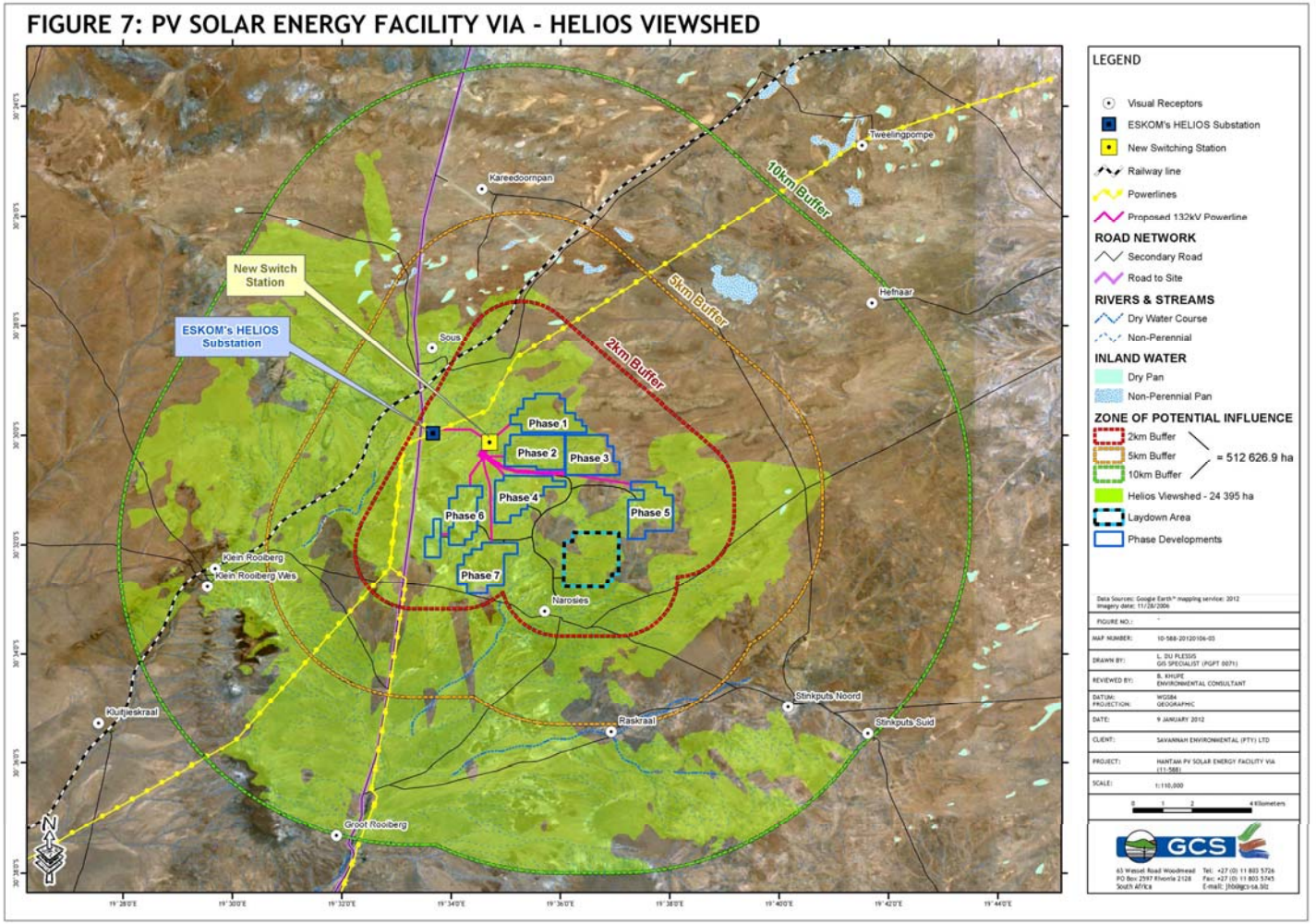

Figure 11.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

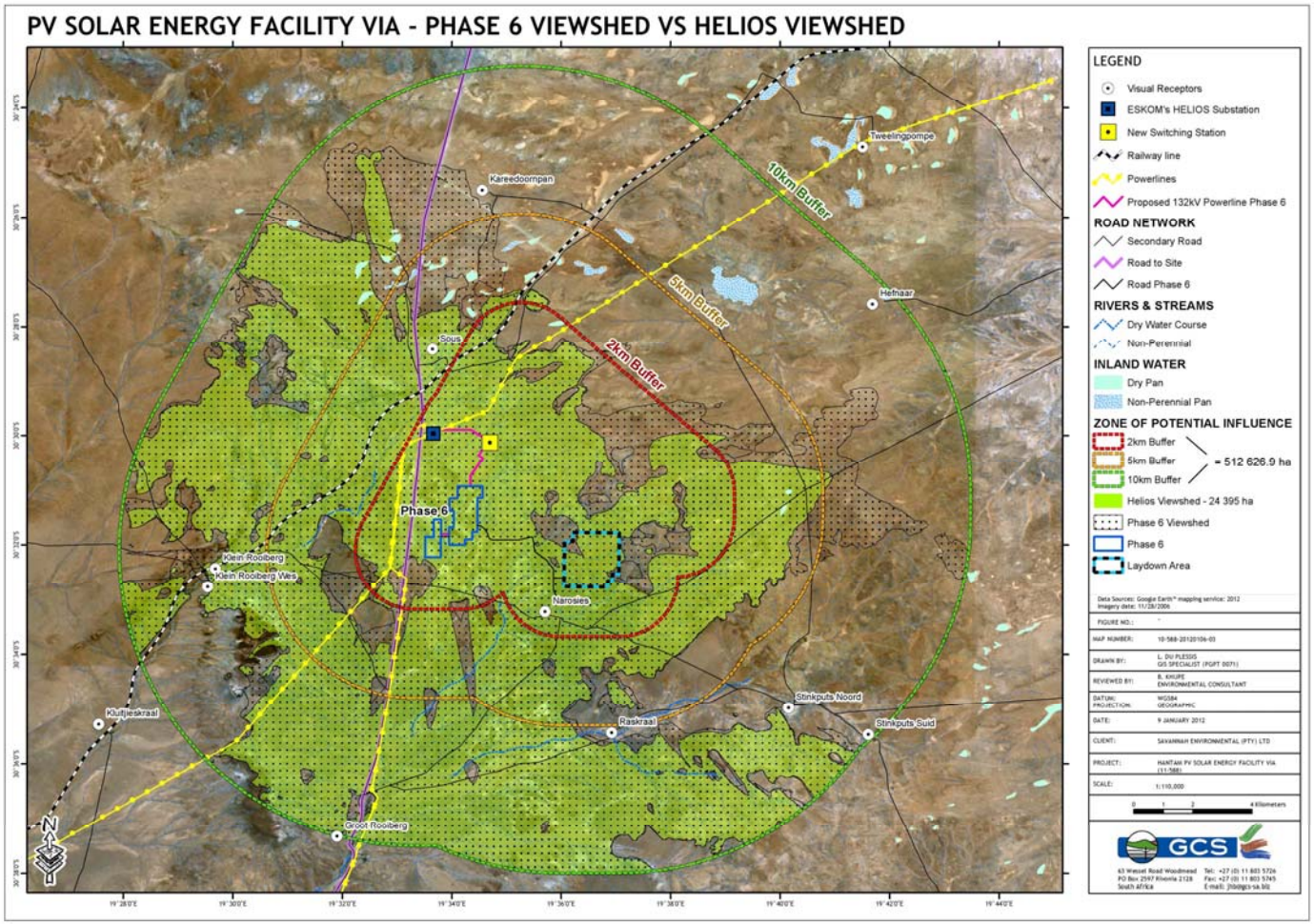

Figure 11.5: Potential visual exposure of the Hantam 6 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 6 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.
The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (50)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be moderate given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

11.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 6 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority

of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, Solar Capital should assist local BEE companies to complete and submit

the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be	

	eliminated	

***Mitigation*:**

- Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;
- Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;
- Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;
- The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;
- The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

- The size of the on-site construction camp should be kept as small as possible;
- The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;
- No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;
- Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;
- No non-mine workers should be allowed to spend the night at the construction camp;
- All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled;

» The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work

in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

- » Solar Capital should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- » Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;

» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining livelihoods	Low (4)
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative

Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts**:** None, provided losses are compensated for.

Residual impacts**:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along

these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[26]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

[26] This assumes the establishment of some form of Community Trust

Nature: Promotion of clean, renewable energy		
	Without Mitigation	***With Mitigation*** *(The provision of renewable energy infrastructure is in itself a mitigation measure)*
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**High (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be enhanced?	Yes	
Enhancement: The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; » Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)

	(For job seekers that stay on the town)	(For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

- Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;
- Implement a policy that no employment will be available at the gate

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

Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related income.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)

Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	

Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		

Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.
Residual impacts: See cumulative impacts

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 6 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

11.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[27]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED HANTAM 7 PV SOLAR ENERGY FACILITY: CHAPTER 12

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the proposed **Hantam 7 PV Solar Energy Facility**, as well as for all of the facility's components. .

The **Hantam 7 PV Solar Energy Facility** will be comprised of the following components:

» An array of **photovoltaic panels** with a generating capacity of up to **75 MW**.
» **Support structures** to mount the photovoltaic panels. The angle of the panels will be tilted at 25° from the horizontal plane, facing north and may be adjusted to optimise for summer or winter solar radiation characteristics and for daily movement of the sun east to west. The maximum height of the PV panels once mounted will be approximately 1.8 – 2 m from ground level.
» **Invertors** which are required to convert the electricity from direct current to alternating current.
» **Cabling** between the project components, to be laid underground where practical.
» An onsite **substation**
» A new overhead distribution **power line** (approximately 3522 m) from the onsite substation to connect to an on-site **switching station** (which is to be shared by all phases). The shared switching station will connect into Eskom's existing Helios Substation located on the western boundary of the site via an ~1800 m of power line.
» **Access roads** with a width of less than 5 m and approximately 3730 m long within the site (for the purposes of construction and limited maintenance during operation).
» Temporary **laydown** and **storage areas** in an area approximately 274.3 ha within the site proposed for development. The laydown area is to be shared by all phases of the proposed development.

The development of the Hantam 7 PV Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include preconstruction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas, transportation of components/construction equipment to site; and undertaking

site rehabilitation and establishment and implementation of a stormwater management plan.

» *Operation* – will include operation of the facility and the generation of electricity.

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately and in further detail within this chapter.

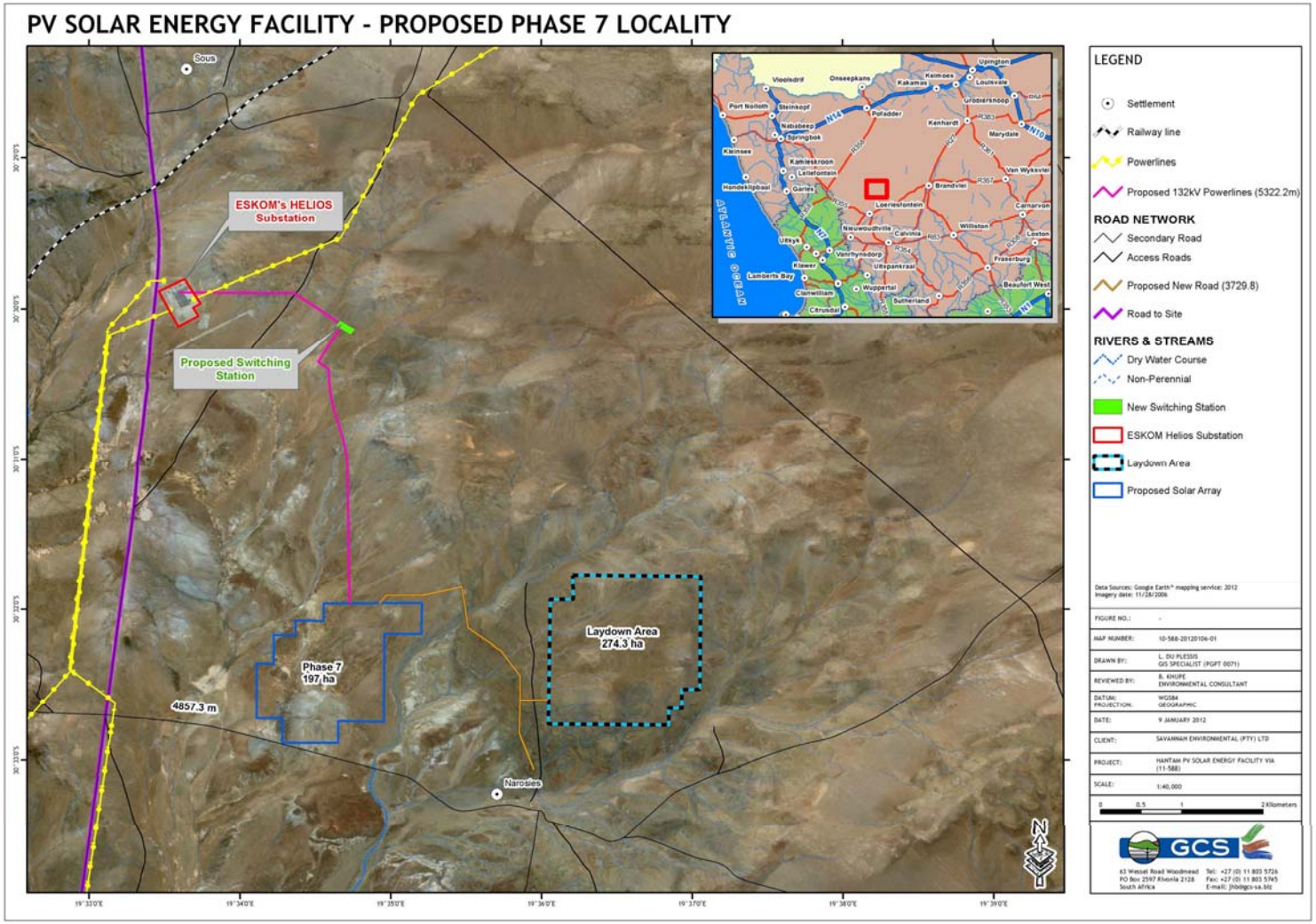

Figure 12.1: Preliminary layout of the proposed Hantam 7 PV Solar Energy Facility and associated infrastructure

12.1 Areas of Sensitivity

The broader study site of 6 764 ha in extent (i.e. the farm portion in its entirety) was evaluated within the scoping study (Savannah Environmental, December 2011). No environmental fatal flaws were identified to be associated with the site. However, from the preliminary sensitivity analysis undertaken, potentially sensitive areas within the broader site were identified. In order to reduce the potential for on-site environmental impacts, it was stated that these areas should be avoided as far as reasonably possible through the micro-siting of the components of the proposed facility. These potentially sensitive areas identified through the scoping study include:

» *Drainage lines within the site* **-** There are a number of drainage lines and pans that occur on the site[28].
» *Social and visual impacts* **-** from a social (security issues), visual (visibility of the facility), health and safety (operation risks such as fire due to presence of infrastructure) and economic (job creation although limited) perspective, impacts could occur on people in close proximity to the PV facility.

These and other environmental issues have been assessed during the EIA Phase. The sensitivity map produced from the Scoping Phase of the EIA process has been updated to include areas of high sensitivity confirmed during the EIA studies and field surveys, as well as the preliminary layout of the proposed facility (refer to Figure 12.2). This map indicates how the design of the proposed facility has taken identified sensitive areas into consideration.

[28] According to the National Water Act, these are classified as wetlands or water resources.

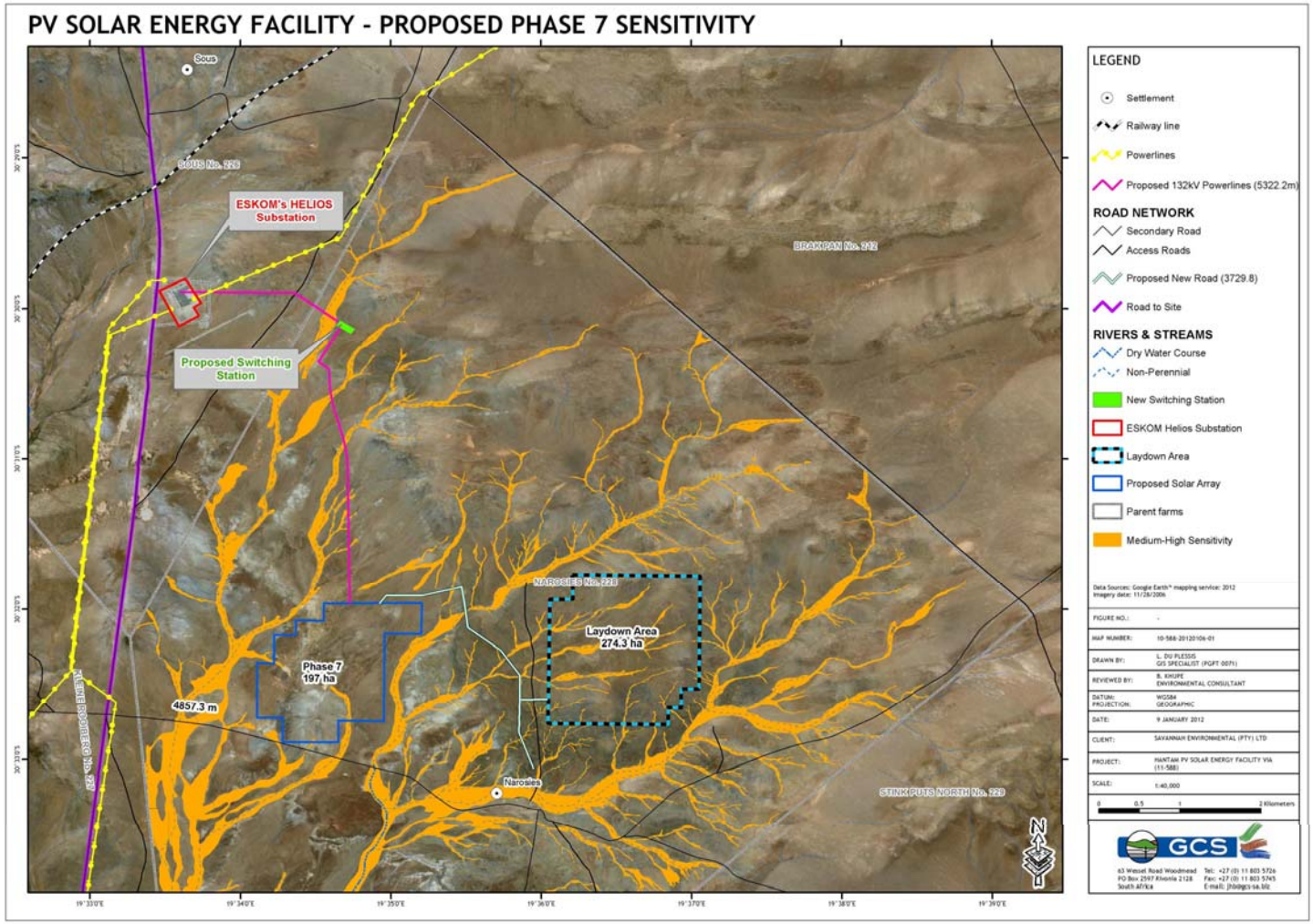

Figure 12.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

12.2 Issues raised as part of the Public Participation Process

The opportunity to comment on the proposed project has been provided through the EIA process. This has included the use of stakeholder letters, a Background Information Document (BID), newspaper advertisements, site notices, and public and focus group meetings held in both the Scoping and EIA Phases. Comments raised to date in the process have included the following:

» *Social* - employment opportunities, visual and aesthetics and socio-economic impacts,
» *Biophysical* – impacts on protected trees
» *EIA process* – public participation (I&AP registration)

12.3 Methodology for the assessment of Potentially Significant Impacts

A broader site of 6 764 ha (i.e. Farm Narosies 228) was identified by the project developer for the purpose of establishing the proposed Hantam 7 PV Solar facility. However, the development footprint will cover an area of approximately 197 ha in extent (for Hantam 7 only), which has been sited considering the identified environmental sensitivities and technical preferences (refer to Figure 12.2). The site is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The Hantam 7 PV Solar Energy Facility forms the seventh phase of the broader development proposed to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the Request for Proposal (RfP) issued by the Department of Energy), the seven phases were registered as separate projects to be assessed within one EIA report. The Hantam 7 PV Solar Energy Facility was therefore issued with DEA reference number **12/12/20/2049/7.** The assessment of potential impacts that follows therefore only considers the impacts associated with Hantam 7 PV Solar Energy Facility.

The assessment of potential impacts has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The revised Comments and Response Report included within Appendix D lists these issues and the responses given by the EAP during the Scoping Phase.

12.4 Assessment of the Potential Impacts associated with the Construction and Operation Phases of the proposed Hantam 7 PV solar energy facility

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed **Hantam 7 PV Solar Energy Facility** on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the photovoltaic panels and associated infrastructure, as well as the linear infrastructure (i.e. access road and power line infrastructure) (refer to the table below).

Permanent Component	Approximate extent (in ha)
PV panels including associated infrastructure	197
Distribution power line	4.3
Switching station	1
Substation	1
Access roads	1.9
TOTAL (ha)	(a total area of 205.2 ha of 6 764 ha) **~ 3 % of site**

Temporarily affected areas will comprise the following:

Temporary Component	Approximate extent (in ha)
Laydown area	274.3
TOTAL (ha)	(a total area of 274.3 ha of 6 764 ha) **~ 4 % of site**

The temporary laydown areas of approximately 274.3 ha (4% of the site) will be shared by all phases of the proposed development. This area is to be rehabilitated after construction phase.

12.4.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix F for more details):

» Impacts on indigenous natural vegetation – assessed to be of **low** to **medium** significance.
» Impacts on protected plants - assessed to be of **low** significance.
» Impacts on threatened animals - assessed to be of **low** significance.
» Impacts on drainage areas/watercourses - assessed to be of **low** to **medium** significance.
» Establishment/spread of declared weeds and alien invader plants - assessed to be of **low** to **medium** significance.

The overall impacts of the proposed project on ecology have been assessed as being of **low to medium** significance.

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

Significance of impacts associated with the solar arrays, switching station and roads

The proposed PV array is in an area of natural vegetation and also affects drainage areas, identified as being sensitive in the scoping phase. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants and the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**

Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only to a small extent	
Mitigation: Avoid unnecessary impacts on natural vegetation surrounding the solar array. Impacts should be contained, as much as possible, within the footprint of the infrastructure.		
Cumulative impacts: Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the solar array, switching station and internal access roads.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)
There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.		
Cumulative impacts:		

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
Residual Impacts: Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (Least Concern globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon, Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Development of the solar facility will lead to loss of a significant proportion of the natural habitat on site (affecting the northern half of the study area), but this is relatively insignificant compared to the overall availability of habitat in this region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Damage to wetland / watercourse areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses.

	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to Low (5)	Low (4)

Probability	definite (5)	Highly probable (4)
Significance	**medium (55)**	**medium (40)**
Status (positive or negative)	Negative	negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

» Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. This would require ensuring that ground surfaces do not remain bare.

» A comprehensive stormwater management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before stormwater is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. Current project design already foresees the use of gutter-like rainwater collection channels below the panels, in order to drive runoff water from panels to underground water tanks.

» There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WULA, depending on the activity.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Significance of impacts associated with the powerlines

The proposed overhead power lines will connect array areas to the on-site switching station and from there to the existing Eskom substation. The impacts of potential concern are therefore on natural vegetation, drainage areas, habitat for threatened birds, protected plants, due to collisions of birds with power lines and due to the potential establishment and spread of alien plants.

Nature: Loss of habitat within indigenous natural vegetation types
The most widespread vegetation type on site is Bushmanland Basin Shrubland, which is classified as Least Threatened. Terrestrial vegetation on site is therefore not considered to be of high conservation value. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (2)	Medium-term (2)
Magnitude	small (3)	small (2)
Probability	probable (3)	probable (3)
Significance	**low (18)**	**low (15)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	

Mitigation:
» Only the centre-line of the servitude should be cleared and not the entire servitude. In the remainder of the servitude, only trees higher than 4 m should be cleared.
» Avoid unnecessary impacts on natural vegetation surrounding the power line servitude.

Impacts should be contained, as much as possible, within the footprint of the infrastructure. » Service roads must be properly maintained to avoid erosion impacts.
Cumulative impacts: Soil erosion may lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts: None.

Nature: Impacts on individuals of protected plant species (Hoodia gordonii)

There is one plant species that is protected according to National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that has a geographic distribution that includes the study area, *Hoodia gordonii*. No individuals were found during the field survey, but it is still considered possible that it occurs on site. If any individuals or populations are affected, they will constitute a small component of the overall distribution of the species and, given the sparse distribution of individuals, likely to affect an insignificant proportion of the global population. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Small (3)	Low (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. A walk-through survey of the footprint of infrastructure should be undertaken by a qualified botanist prior to construction in order to identify the location of any individuals that may occur there. Any individuals found should be rescued and handled according to directions from Provincial Nature Conservation.

Cumulative impacts:

Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:

Unlikely to be residual impacts.

Nature: Impacts on individuals of threatened animal species

There are 10 threatened or near threatened bird species that could occur in available habitats in the proposed study area and two near threatened (LC globally) mammal species. These are the Kori Bustard, Ludwig's Bustard, Sclater's Lark, Black Harrier, Lanner Falcon,

Lesser Kestrel, Martial Eagle, Peregrine Falcon, Red Lark and Secretarybird and the Honey Badger and Littledale's Whistling Rat. Construction of power lines will lead to loss of an insignificant proportion of the natural habitat on site.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Small (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:
Avoid impacts on natural habitats outside the footprint of the proposed infrastructure. Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.

Cumulative impacts:
Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.

Residual Impacts:
Unlikely to be residual impacts.

Nature: Bird collisions with power lines
There is a moderate likelihood of threatened or near threatened bird species occurring along the proposed overhead power line routes. The potential impact on them due to collisions is therefore not considered likely to be of high frequency. The proposed new power lines would be located where there are limited existing power lines.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (3)	small (2)
Probability	probable (3)	improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:
Devices to make lines more visible must be attached to overhead power lines.

Cumulative impacts:
None
Residual Impacts:
None likely

Nature: Damage to wetland areas resulting in hydrological impacts

There are a number of dry stream beds and drainage areas on site. According to the National Water Act, these are classified as water resources. Construction may lead to some direct or indirect loss of or damage to these affected areas or changes to the catchment of these areas. Affected areas are largely ephemeral first-order drainage areas and do not qualify to be classified as watercourses

	Without mitigation	**With mitigation**
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Small (2)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with effective rehabilitation	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	

Mitigation:

(19) Place tower structures a minimum of 50 m from watercourses.

(20) Service roads in the servitude must be properly maintained to avoid erosion impacts.

(21) If not, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Cumulative impacts:

Soil erosion, alien invasions, may all lead to additional impacts on watercourse habitats that will exacerbate this impact.

Residual Impacts:

None.

Nature: Establishment and spread of declared weeds and alien invader plants

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks and drainage lines in semi-arid and arid regions and has been recorded on and near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (2)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not translocate soil stockpiles from areas with alien plants » Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove » Establish an on-going monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

Implications for Project Implementation

» The development footprints will not impact on any ecological "no go" habitats or areas.
» The proposed development will have impacts on the drainage features on site. However, any impacts on these areas might require a permit from the relevant National Department of Water Affairs.

12.4.2 Potential Impacts on Soils and Agricultural Potential

The most important direct impact is soil degradation including erosion from the area of construction activity. The erodibility of the soils on the site is associated with the sparse vegetation cover and thin soil profiles.

In terms of agricultural potential, the potential significance was rated as having a predominately low significance. The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The

grazing capacity of the site is very low due to the same constraints (climate and soils).

Impact tables summarising the significance of impacts on soils and agricultural potential (with and without mitigation)

Nature: disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of solar panels, stands, roads, buildings and other infrastructure with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit footprint to the immediate development area. Rehabilitation possible after removal of infrastructure due to the low agricultural potential baseline of the development area.

Cumulative Impacts:

» The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.

Residual Impacts:

» None

Nature: disturbance of soils and impacts on existing land use due to construction of roads

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils). This activity entails the construction of roads with the associated disturbance of soils and existing land use.

	Without mitigation	***With mitigation***

Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes,	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative Impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual Impacts: » None		

Nature: Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles This activity entails the operation of vehicles on site and their associated impacts in terms of spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	
Mitigation: » Maintain vehicles, prevent and address spillages.		
Cumulative Impacts: » The cumulative impact of this activity will be small if managed.		
Residual Impacts: » None		

Nature: Impact of dust generation on site

This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.

	Without mitigation	***With mitigation***
Extent	Local (2)	Site (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit vehicle movement to absolute minimum, construct appropriate roads for access.

Cumulative Impacts:

» The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.

Residual Impacts:

» None

Nature of Impact: Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.

The agricultural potential of the site is very low due to soil and climatic constraints. The specific nature of the soils on the site precludes any form of crop production through irrigation or dryland practices. The grazing capacity of the site is very low due to the same constraints (climate and soils).

	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) – Site
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Highly probable (4)	Highly probable (4)
Significance*	**32 (Low)**	**32 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	No

Mitigation*:*

The loss of agricultural land is a long-term loss and there are no mitigation measures that can be put in place to combat this loss. In the case of low agriculture potential, soil impacts

can be rehabilitated afterwards if infrastructure is removed.
Cumulative impacts: Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual Impacts: The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential for the area is very low though.

Implications for Project Implementation

» The proposed development of a photovoltaic facility on the site, will not have large impacts due to the low agricultural potential of the area proposed for development.
» An aspect that should be noted is the dominance of shale and slate rocks on the site. These have a distinct tendency to cut tyres and lead to punctures. During the construction process the development team should implement countering measures in the form of using adequate tyres or to construct roads and track that do not have such rocks on the road surface.

12.4.3 Assessment of Potential Impacts on Heritage Sites

No sites of heritage significance were identified during the survey. However, due to the nature of some heritage resources, there is potential to expose and/ damage unknown artefacts during construction. The potential impact on surface and/or sub-surface artefacts is however rated to be low.

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

Nature: Impacts on heritage resources During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	Yes	

mitigated?		
Mitigation: No sites were identified during the survey. However, if any archaeological material is uncovered during construction or operation a qualified archaeologist must be contacted to verify and record the find. Mitigation will then include documentation and sampling of the material. This will also be required if any paleontological material is uncovered.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» From an archaeological perspective, no sites of heritage significance were identified.
» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

12.4.4 Assessment of Potential Visual Impacts

The following methodology was used in order to derive the visual impact.

Identification of the Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Therefore, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 10km (see Figure 10.3). Over 10km the impact of the proposed infrastructure on visibility would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze). On the other hand, the visual impact of the project components within a distance of 2000m or less would be at its maximum.

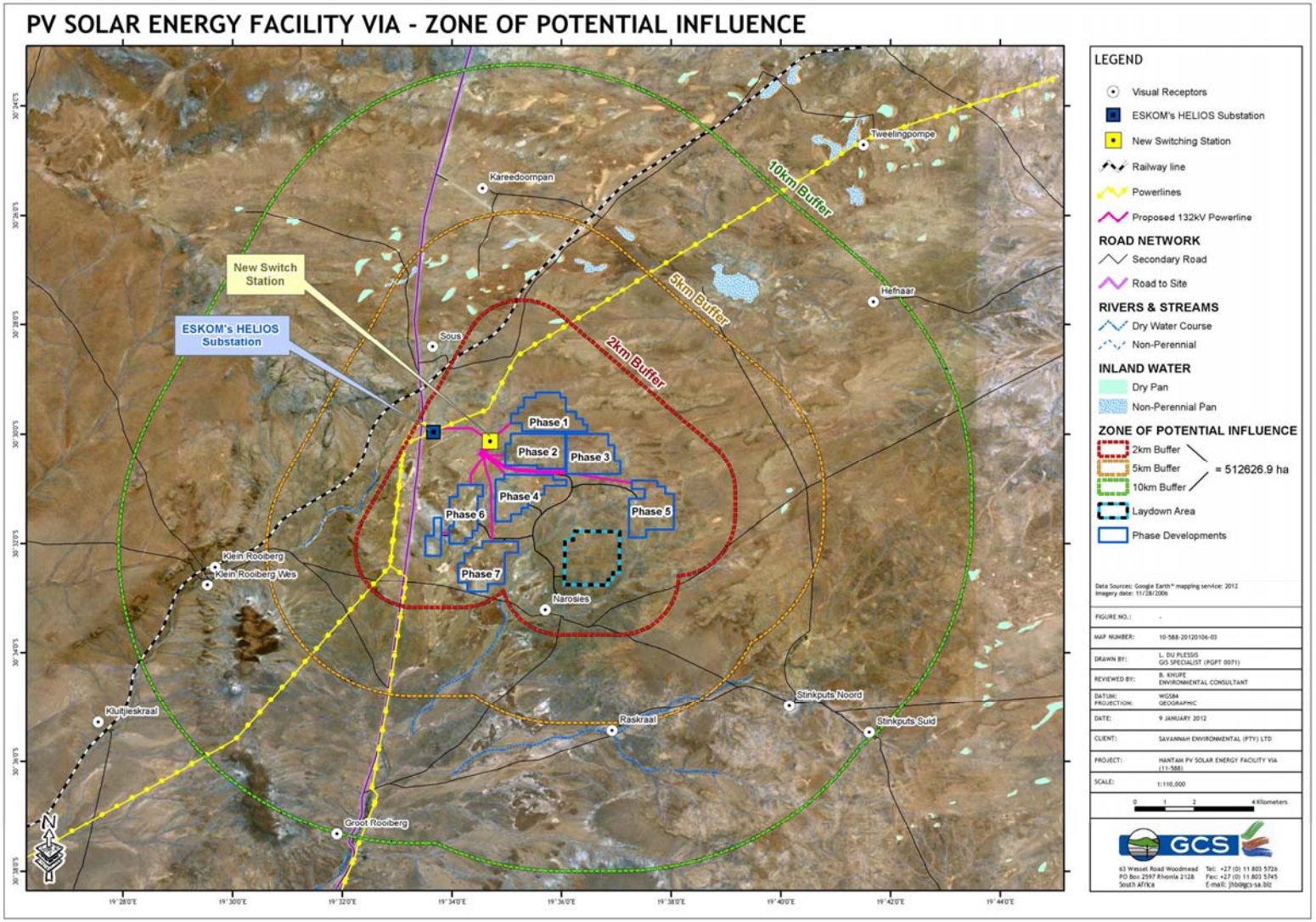

Figure 12.3: Zone of Potential Influence of the Hantam PV Solar Energy Facility

Viewshed Analysis

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site and its environs at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM includes features such as vegetation, rivers, roads and nearby urban areas. These features were draped over the topographic data to complete the model used to generate the viewshed analysis. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Separate viewsheds were calculated to assess the visual impact of the various components of the proposed development. These viewsheds are;

- The existing Helios Substation (refer to Figure 12.4).
- The proposed switching station.
- The 132kV powerlines feeding into the switching station from the solar panels.
- The photovoltaic solar panels and associated infrastructure (refer to Figure 12.5).

A viewshed for the existing Helios Substation was included in the analysis to aid as a source of comparison in order to determine where the proposed new development's viewshed will overlap with current areas that are already visually exposed to this transmission substation.

The viewshed areas were all calculated within the 10km zone of potential influence boundary (an area 512626.9 ha in extent) as the viewshed beyond this point becomes highly subjective. Based on the viewshed analysis, the facility will be potentially visible to 58.8 % of the zone of influence. However, the viewshed of the facility has a 80.1% overlap with the viewshed of the existing Helios Substation. The Hantam 7 PV facility will be potentially visible to the following 5 homesteads/settlements:

- *Sous,*
- *Klein Rooiberg*
- *Klein Wes,*
- *Narosies*
- *Groot Rooiberg*

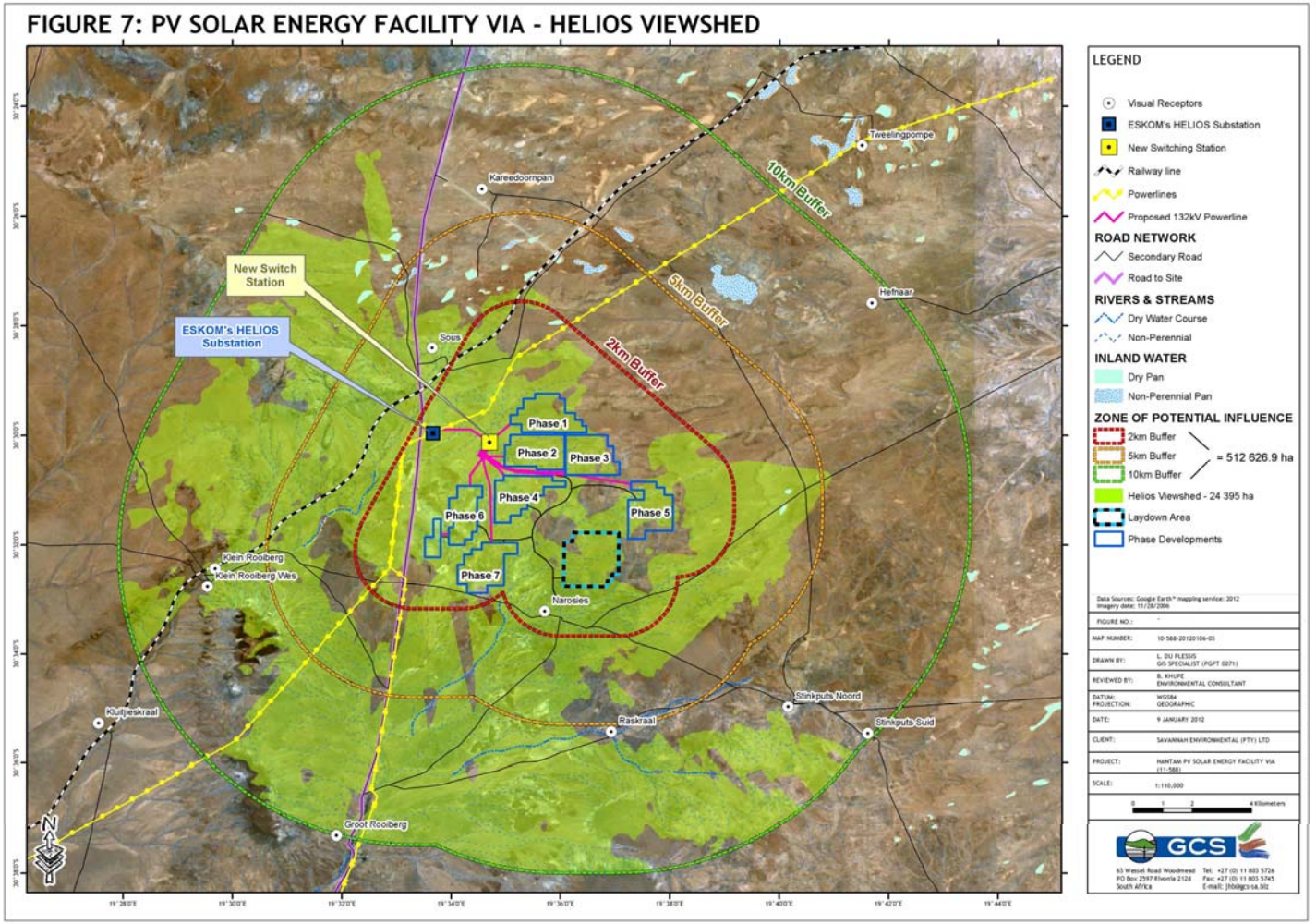

Figure 12.4: Potential visual exposure of the existing Helios Substation

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features.

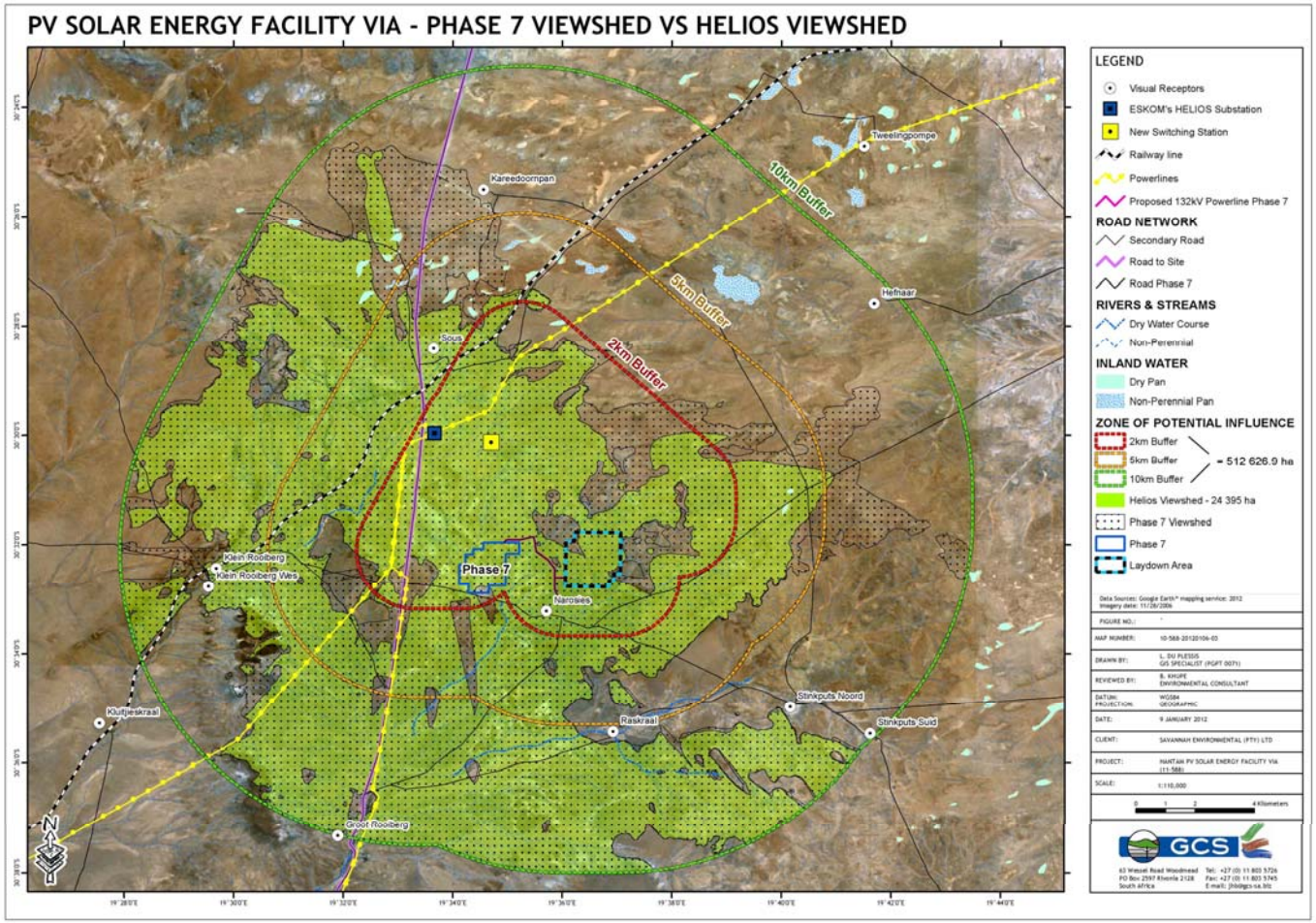

Figure 12.5: Potential visual exposure of the Hantam 7 PV Solar Energy Facility (hatched area) compared to the existing Helios Substation (green area)

The potential visual exposure as illustrated is a theoretical representation of where visual receptors would be able to see the facility from. This does not take into consideration local factors such as vegetation, orientation of structures and views, and localised topographical features

The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating a mundane landscape covered in grass.

Terrain variability - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

It is concluded that the study area possesses a medium visual absorption capacity based on the following:

- The sparseness of vegetation and the lack of structures or notable landforms provide a low degree of visual screening.
- Terrain variability is low as the topography is characterised by gentle slopes with very little change in elevation.
- Land cover is rated as high as there are multiple high rise electrical lines and the Helios substation directly associated with the land cover.

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

Nature: Visual impact of the proposed Hantam 7 PV solar energy facility and associated infrastructure adjacent homesteads and users of adjacent roads.
The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity. The potential visual impact of the facility is negative due to the existing Helios Substation and associated infrastructure as well as the number of potential visual receptors.

	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	High (5)	High (5)
Magnitude	Low (3)	Low (2)
Probability	High (5)	High (5)
Significance	**Medium (50)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- 100m Buffer around Solar Arrays.
- Cables can be buried underground.
- Buildings can be blended with natural paint colours.
- Mitigation on power lines is difficult as building specifications are stringent.

Cumulative impacts:

- The 132kV powerlines are surrounded by existing power lines feeding into the Helios Substation. They will therefore have a high cumulative impact as they add to this existing disturbance.
- The solar array will have a high cumulative impact as it is adjacent to the main road and the Helios Substation.
- The close proximity of the switching station to the Helios Substation will ensure that this structure is absorbed by the existing Helios Substation infrastructure. It will therefore have a low cumulative impact.

Residual Impacts: Residual visual impacts will remain as long as the facility is operational.

Implications for Project Implementation

» The anticipated visual impacts of the facility will be moderate given the already existing infrastructure and the number of potential receptors around the site. Therefore, the visual impacts are not considered to be a fatal flaw for the proposed solar energy facility.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
» A buffer of approximately 100 m in width of intact natural vegetation should be left along the perimeter of the development area and/or along the site boundary.

11.4.5 Assessment of Potential Social Impacts

The construction phase of the Hantam 7 PV Solar Energy Facility is anticipated to extend over a 12 month period. The following positive impacts are expected for both the construction and operational phases:

» Creation of employment and business opportunities and opportunity for skills development and on-site training.

Potential negative impacts will include:

» Impacts associated with the presence of construction workers on site
» Influx of job seekers to the area;
» Loss of farm labour to the construction phase;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site;
» Increased risk of veld fires;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;
» Potential loss of grazing land associated with construction-related activities.

Impact tables summarising the significance of social impacts during the construction and operational phases (with and without mitigation)

Nature: Creation of employment and business opportunities during the construction phase

Based on information provided by the proponent it is anticipated that approximately 80% of the employment opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 10% to semi-skilled (drivers, equipment operators etc.) and 10% to skilled personnel (engineers, land surveyors, project managers etc.). The majority

of the employment opportunities, specifically the low and semi-skilled opportunities, are therefore likely to be available to members from the local Historically Disadvantaged (HD) community who reside in Loeriesfontein, Calvinia and Nieuwoutsville.

	Without Mitigation	***With Enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (4)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**High (64)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement **:**

Employment

» Where reasonable and practical, Solar Capital should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
» Before the construction phase commences Solar Capital should meet with representatives from the Hantam Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Solar Capital intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Solar Capital should liaise with the Hantam Local Municipality with regards the establishment of a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, Solar Capital should assist local BEE companies to complete and submit

the required tender forms and associated information. » The Hantam Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
***Cumulative impacts*:** Opportunity to up-grade and improve skills levels in the area.
***Residual impacts*:** Improved pool of skills and experience in the local area.

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

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

	Without Mitigation	***With Mitigation***
Extent	Local (3)	Local (2)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (28)** for the community as a whole Moderate-High **(54)** for specific individuals who may be affected by STD's etc.	Low **(24)** for the community as a whole Moderate-High **(51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be	

	eliminated	

***Mitigation*:**

- Where possible, Solar Capital should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;
- Solar Capital should consider the establishment of a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Hantam Councillors, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;
- Solar Capital and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- Solar Capital and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours;
- The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;
- The contractors should ensure that all non-local workers are provided with transport back to their home towns within 2 days of their contracts coming to an end. This would reduce the risk of them staying on in the area and the potential risk to local family structures and social networks;
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

On-site construction camp

The following measures should be considered if an on-site construction camp is required.

- The size of the on-site construction camp should be kept as small as possible;
- The movement of construction workers on and off the site should be managed so as to minimize the potential risk to local farmers and farm workers in the area;
- No staff living on the site should be permitted to sleep over in any of the local towns, settlements or farms. Workers that do sleep over should be dismissed;
- Access to the construction camp should be strictly controlled. Unauthorised personnel should not be allowed access to the mine village;
- No non-mine workers should be allowed to spend the night at the construction camp;
- All activities that pose a potential threat to farming in the area (such as fires, poaching etc.) must be controlled;

» The on-site living conditions must also cater for the well-being of the workers. In this regard the construction camp should provide recreational facilities and a canteen.
***Cumulative impacts*:** Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
***Residual impacts*:** See cumulative impacts.

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

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community

	Without Mitigation	***With Mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2) for the community as a whole Very High (10) for specific individuals who may be affected by STD's etc.	Minor (2) for community as a whole Very High (10) for specific individuals who may be affected by STD's etc.
Probability	Probable (3)	Probable (3)
Significance	**Low (27)** for the community as a whole **Medium (54)** for specific individuals who may be affected by STD's etc.	**Low (24)** for the community as a whole **Medium (51)** for specific individuals who may be affected by STD's etc.
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

***Mitigation*:**
It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Local Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
» Implement a policy that no employment will be available at the gate.

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

***Residual impacts*:** See cumulative impacts.

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

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

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

Mitigation:

While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work

in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

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

***Cumulative impacts*:** Impacts on farm operations due to loss of experienced farm labour

***Residual impacts*:** See cumulative impacts.

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

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested. Ms Mol, the owner of the farm, indicated that while stock theft was not currently an issue, it may become a problem if labour is accommodated on the site. However, with mitigation, the significance of this impact can be managed.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (22)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes (compensation paid for stock losses etc.)	Yes (compensation paid for stock losses etc.)
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

***Mitigation*:**
Key mitigation measures include:

- Solar Capital should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- Solar Capital should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;

» Solar Capital should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
» Contractors appointed by Solar Capital must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Solar Capital must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
» The housing of construction workers on the site should be strictly managed as per the mitigation measures listed below.

***Cumulative impacts*:** No**,** provided losses are compensated for

***Residual impacts*:** See cumulative impacts.

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

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) due to reliance on livestock for maintaining livelihoods	Low (4)
Probability	Probable (3)	Probable (3)
Significance	***Medium (33)***	***Low (24)***
Status	Negative	Negative

Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of grass fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.
- In addition the landowner should also ensure that they join the local fire protection agency.

***Cumulative impacts*:** None, provided losses are compensated for.

***Residual impacts*:** See cumulative impacts.

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

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. The main access to the site is likely to be via the R355/R357 and the AP2972 secondary road. The AP2972 is an un-surfaced road that is also used to access the Dwaggas Soutwerke (pan brine salt works) located north of the site and the Sishen-Saldanha Railway Line. The existing heavy vehicles that use this road generate large volumes of dust.

The findings of the SIA indicate that the volume of traffic on the R355/R357 and AP2972 is low. The social impacts associated with the movement of construction related traffic along

these roads are therefore likely to be low. The potential dust impacts can also be mitigated by implementing the mitigation measures listed below

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (1)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	***Low (24)***	***Low (15)***
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:
Solar Capital should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits

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

Residual impacts: See cumulative impacts

Nature: Impact on farmland due to construction related activities

The proposed facility is located on Farm Narosies 228, which is owned by Ms Sunay Mol and her family. The Mol family have farmed in the area since 1800s. Ms Mol indicated that the project was a bit bigger than she had anticipated, however, it would not impact on the current farming activities. The area where the proposed PVSEF is located is currently used for game hunting and has not been developed. Ms Mol lives in Cape Town and 2 workers live on the farm. Ms Mol and her family use the farm mainly for holidays, hunting and some sheep farming.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. In addition the rental income from the lease agreement with Solar Capital would compensate for any loss in farming related income. Recommended mitigation measures are outlined below.

	Without Mitigation	***With Mitigation***
Extent	Local (1)	Local (1)
Duration	Long term-permanent (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly Probable (4)
Significance	***Moderate (32)***	***Low (20)***
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

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

» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts: See cumulative impacts.

Impact tables summarising the significance of social impacts during the operational phase of the facility

Nature: ***Creation of employment and business opportunities associated with the operational phase***		
	Without Mitigation	**With Enhancement[29]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (32)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The enhancement measures listed in Section 4.4.1 of the Social Impact Assessment report (refer to Appendix ?), i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • Solar Capital should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • Solar Capital in consultation with the Hantam Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

[29] This assumes the establishment of some form of Community Trust

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

Enhancement:
The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Solar Capital should:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply;
» Maximise the public's exposure to the project via an extensive communication and advertising programme;
» Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project;
» Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Hantam IDP.

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

Residual impacts: See cumulative impacts

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (**27)** **Medium -High** for specific individuals who may be affected by STD's etc**. (54)**	**Low** for the community as a whole **(24)** **Medium-High** for specific individuals who may be affected by STD's etc. **(51)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job. However, as indicated above, Solar Capital should ensure that the employment criteria favour local residents in the area. In addition Solar Capital should:

» Solar Capital, in consultation with the Hantam Municipality, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area;

» Implement a policy that no employment will be available at the gate

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

Residual impacts: See cumulative impacts.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: While Solar Capital could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: See cumulative impacts.		

Nature: Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations

This issue relates to the potential long-term impact of the facility and associated infrastructure on existing farming activities, specifically the loss of land for grazing. This loss may, in turn, impact on the viability of operations and the livelihoods of the affected farmers. As indicated above, the owner of the farm, Ms Mol, has indicated that the proposed PVSEF will not impact on the current farming activities. In addition the rental income from the lease agreement with Solar Capital will more than compensate for any loss in farming related income.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)

Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (16)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Recommendations for the construction phase should be implemented		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In terms of adjacent land owners, there are no farmsteads located in close proximity of the site that are likely to be visually impacted by the proposed facility. The site is also located in an extremely remote area of South Africa. The impact of the proposed PVSEF on the areas sense of place is therefore likely to be low. The closest neighbour (Mr Chris Nel), indicated that while he was not totally familiar with the details of the project, he did not have any major concerns.

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	

Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

Nature: Potential impact on local tourism

The Northern Cape Province Growth Development Strategy notes that the Northern Cape's exceptional natural and cultural attributes creates the potential to make the province the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as solar energy facilities, do not affect the tourism potential of the province. However, the proposed site is located adjacent to the Helios substation and associated power lines and the electrified Sishen-Saldanha Railway Line. The visual integrity of the area has therefore been affected by existing infrastructure in the area. In addition the proposed site is not located in close proximity to any important tourist routes. The impact on the areas tourism potential is therefore likely to be low. In some instances the PVSEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive

	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (27**) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: The recommendations contained in the VIA should be implemented.		

Cumulative impacts: The proposed facility is one of two solar energy facilities proposed in the area. Due to size and height, of the facility, cumulative impacts are not rated significant.
Residual impacts: See cumulative impacts

Impact tables summarising the significance of social impacts during the construction and operational phases of the power line

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.		
Cumulative impacts: Limited visual and impact on sense of place.		
Residual impacts: See cumulative impacts		

Implications for Project Implementation

» The findings of the SIA undertaken for the proposed **Hantam 7 PV Solar Energy Facility** indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The potential for cumulative impacts also exists due to the other applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw.

12.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that, in itself, may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[30]. The subsequent phases of the proposed development will add to the cumulative impacts of the proposed development.

These proposed developments, in addition to the already existing infrastructure (i.e. the Helios Substation and associated power lines), will increase the cumulative visual impact of industrial type infrastructure within the region. From an ecological point of view uncontrolled soil erosion from all the proposed seven phases may lead to establishment of alien invasive plants and loss of habitat for indigenous natural vegetation. From an agricultural potential point of view the cumulative impact of this activity will be small as it is constructed on land with low agricultural potential. These impact can however be mitigated if mitigation measures as recommended in this report and attached EMP are implemented.

The negative cumulative impacts of the proposed developments are offset by the positive cumulative impacts. The proposed developments (all seven phases) have the potential to result in significant positive cumulative impacts, specifically with regards to employment creation. The proposed developments will reduce the pressure on the electricity grid in the Northern Cape Province by injecting an additional 525 MW of energy.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F – K).

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

HANTAM 1 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 13

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 1 PV Solar energy facility (DEA ref: 12/12/20/2049/1). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 1 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[31] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 1 PV solar energy facility have been assessed in Chapter 6 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[31] The approach to undertake one consolidated EIA process has been accepted by DEA

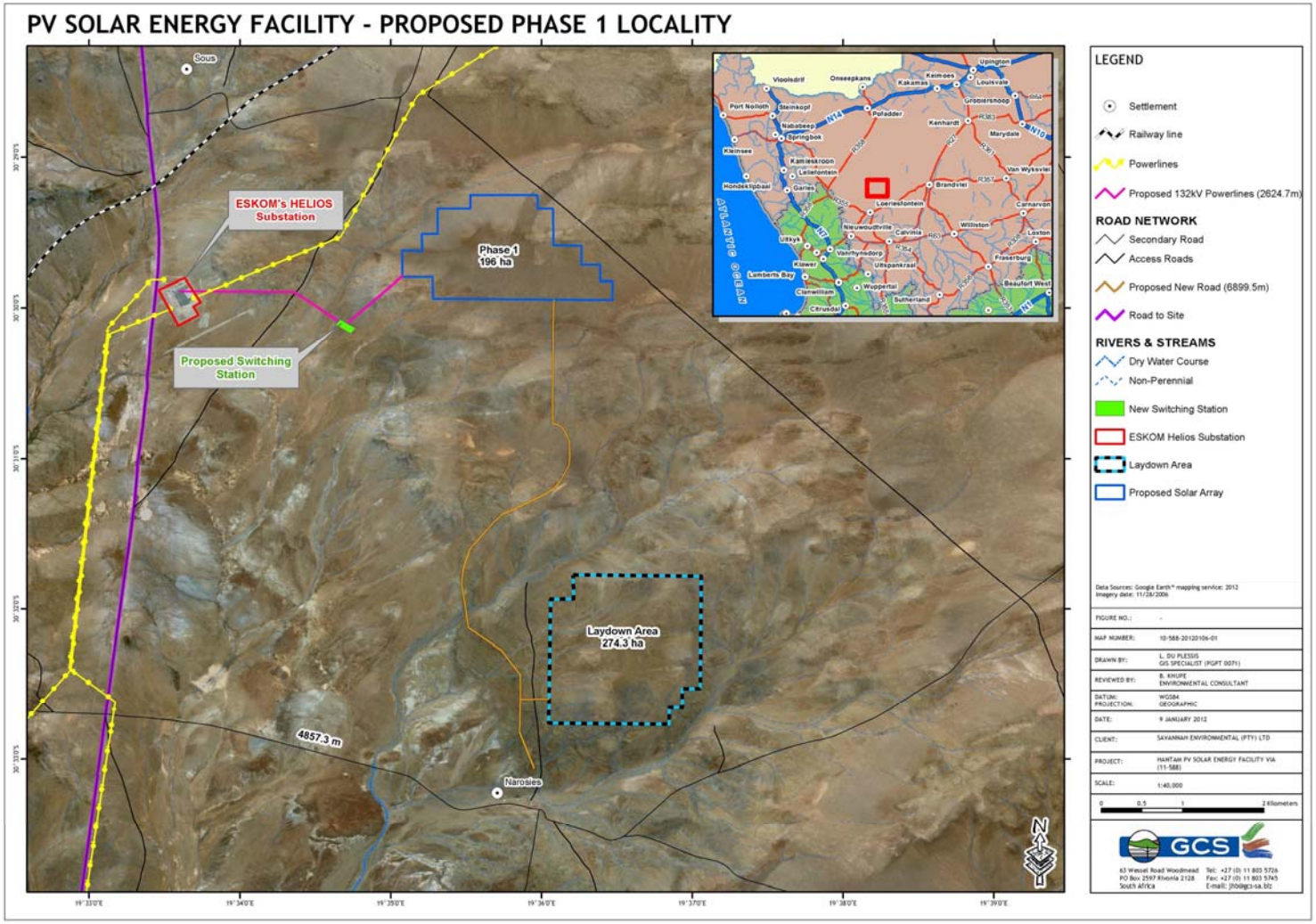

Figure 13.1: Layout of the proposed Hantam 1 PV Solar Energy Facility showing location of the proposed infrastructure

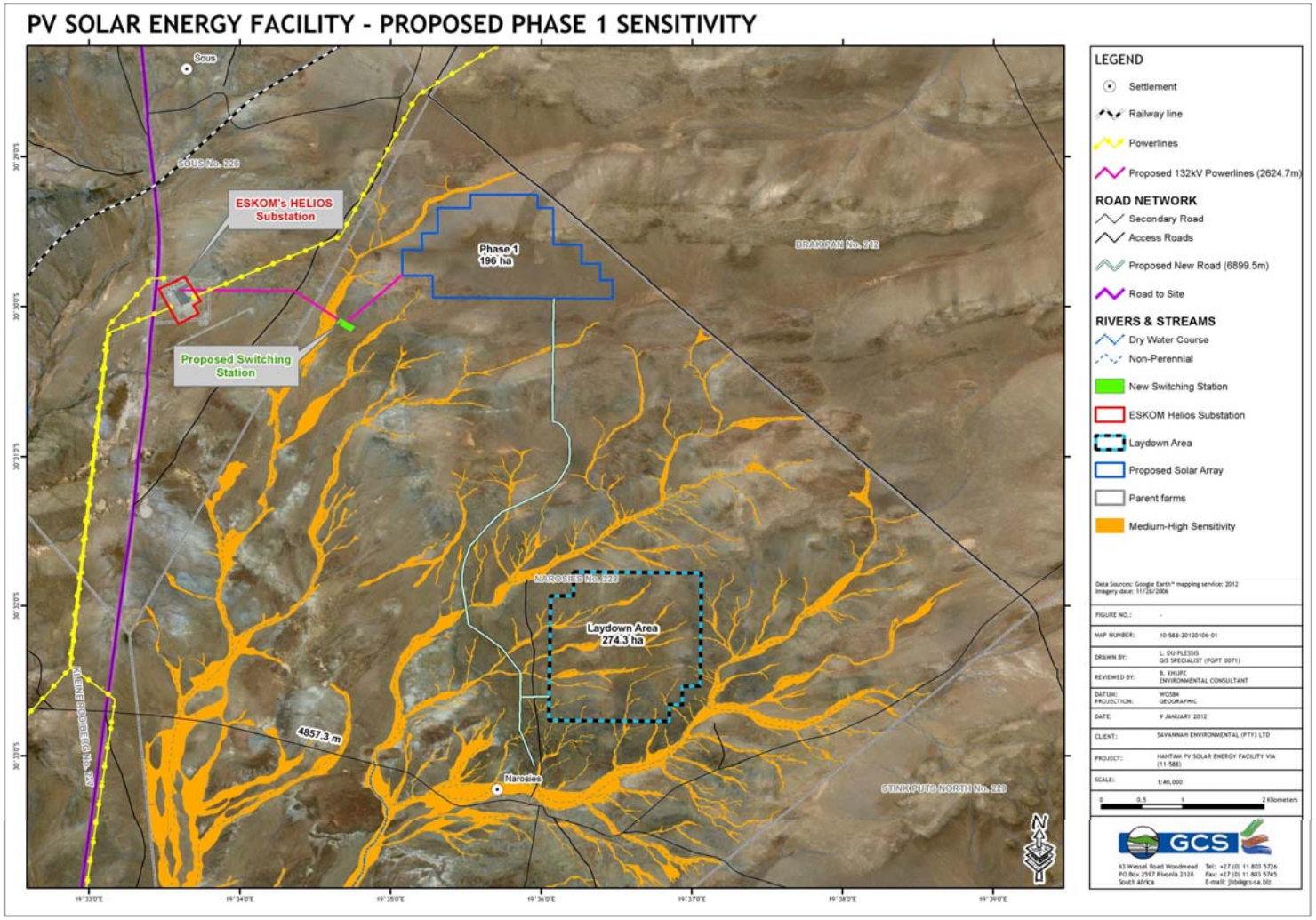

Figure 13.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

13.1. Evaluation of the Proposed Hantam 1 PV Solar Energy Facility

Chapter 6 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 1 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 1 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 1 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 13.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 13.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 1 PV Solar Energy Facilities.

	Hantam 1 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 1PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 1 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

13.1.1. Local Site-specific Impacts

The construction of the Hantam 1 PV solar energy facility will lead to permanent disturbance of an area of approximately 203 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 13.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

13.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

13.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 1 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K1**.

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

13.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 1 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

- All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
- The draft Environmental Management Programme (EMP) as contained within **Appendix K1** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
- Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
- Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
- Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
- Alien invasive plants should be controlled on site.
- A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
- The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

HANTAM 2 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 14

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 2 PV Solar energy facility (DEA ref: 12/12/20/2049/2). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 2 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[32] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 2 PV solar energy facility have been assessed in Chapter 7 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[32] The approach to undertake one consolidated EIA process has been accepted by DEA

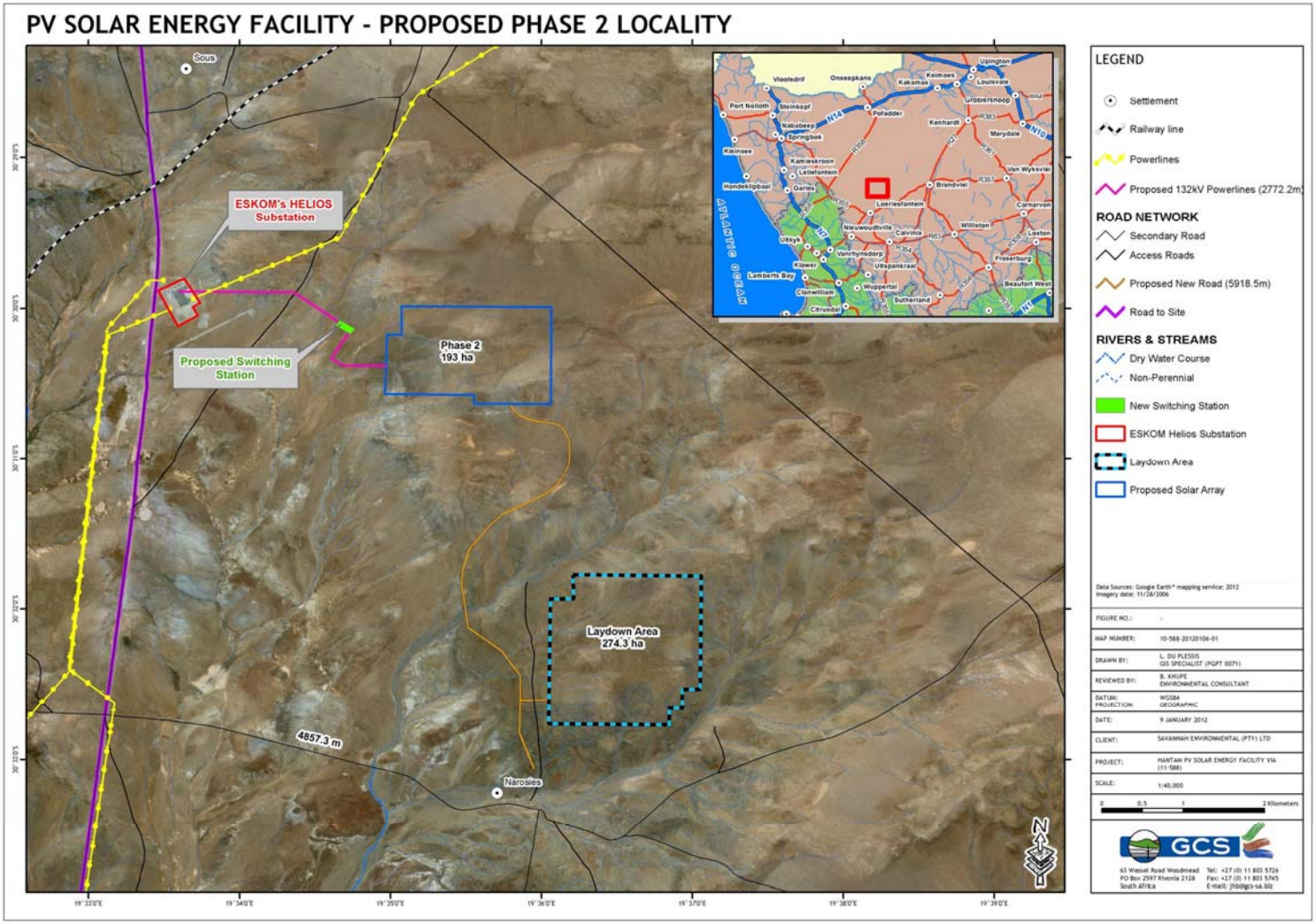

Figure 14.1: Layout of the proposed Hantam 2 PV Solar Energy Facility showing location of the proposed infrastructure

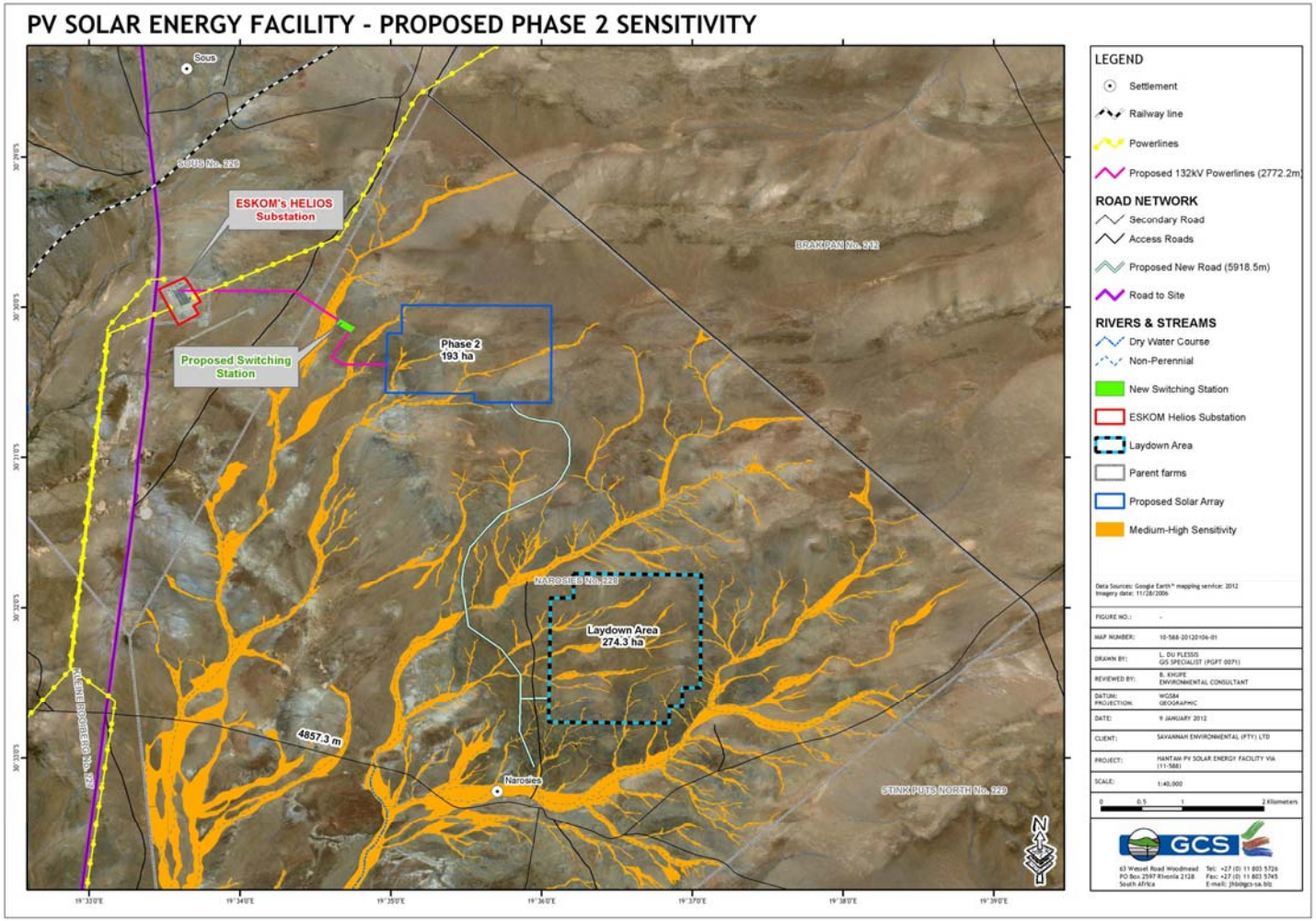

Figure 14.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

14.1. Evaluation of the Proposed Hantam 2 PV Solar Energy Facility

Chapter 7 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 2 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 2 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 2 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 14.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 14.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 2 PV Solar Energy Facilities.

	Hantam 2 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 2PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 2 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

14.1.1. Local Site-specific Impacts

The construction of the Hantam 2 PV solar energy facility will lead to permanent disturbance of an area of approximately 200 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 14.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

14.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

14.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

- The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
- Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
- The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
- On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
- The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 2 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K2**.

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

14.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 2 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

- All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
- The draft Environmental Management Programme (EMP) as contained within **Appendix K2** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
- Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
- Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
- Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
- Alien invasive plants should be controlled on site.
- A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
- The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

HANTAM 3 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 15

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 3 PV Solar energy facility (DEA ref: 12/12/20/2049/3). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 3 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[33] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 3 PV solar energy facility have been assessed in Chapter 8 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[33] The approach to undertake one consolidated EIA process has been accepted by DEA

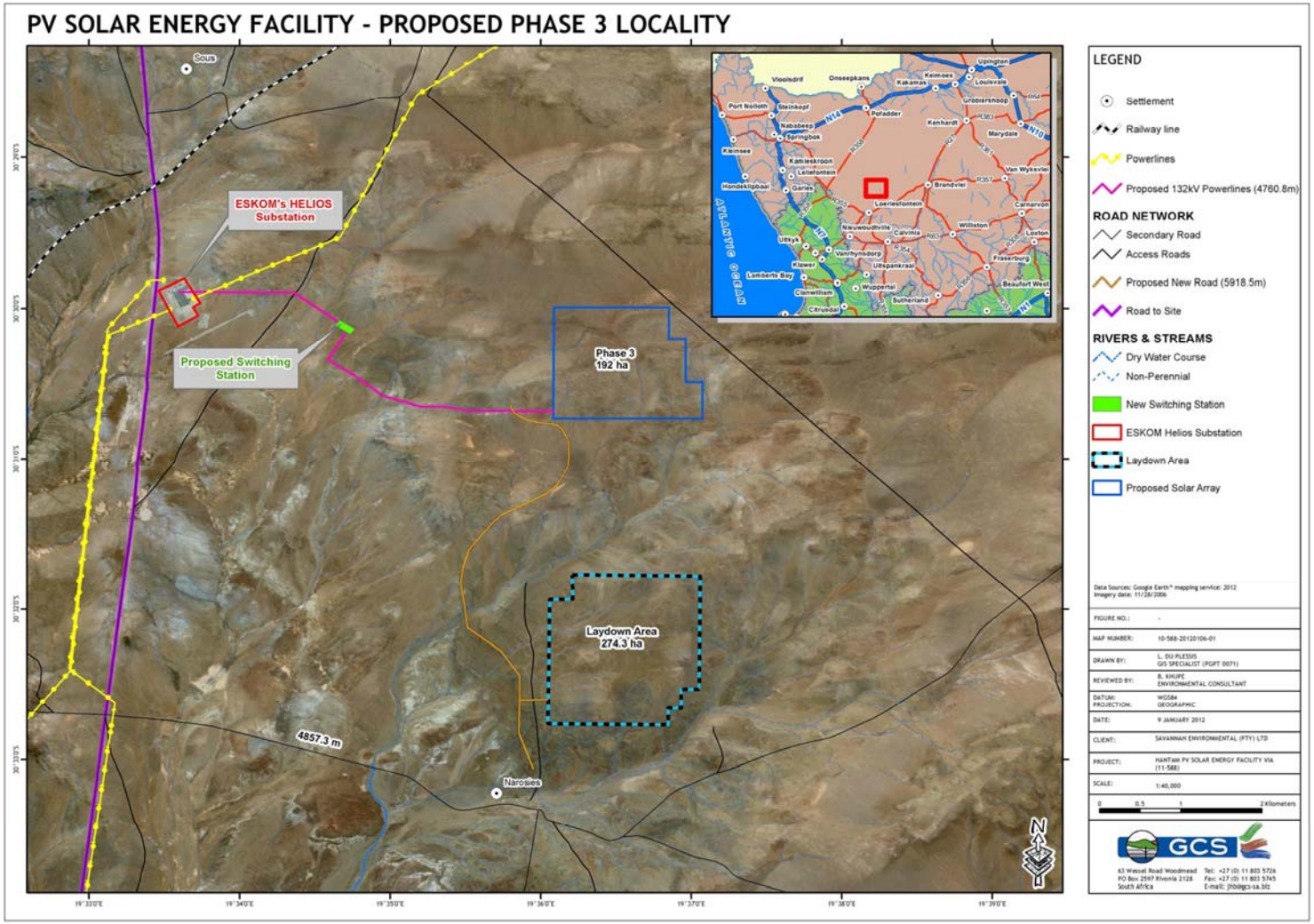

Figure 15.1: Layout of the proposed Hantam 3 PV Solar Energy Facility showing location of the proposed infrastructure

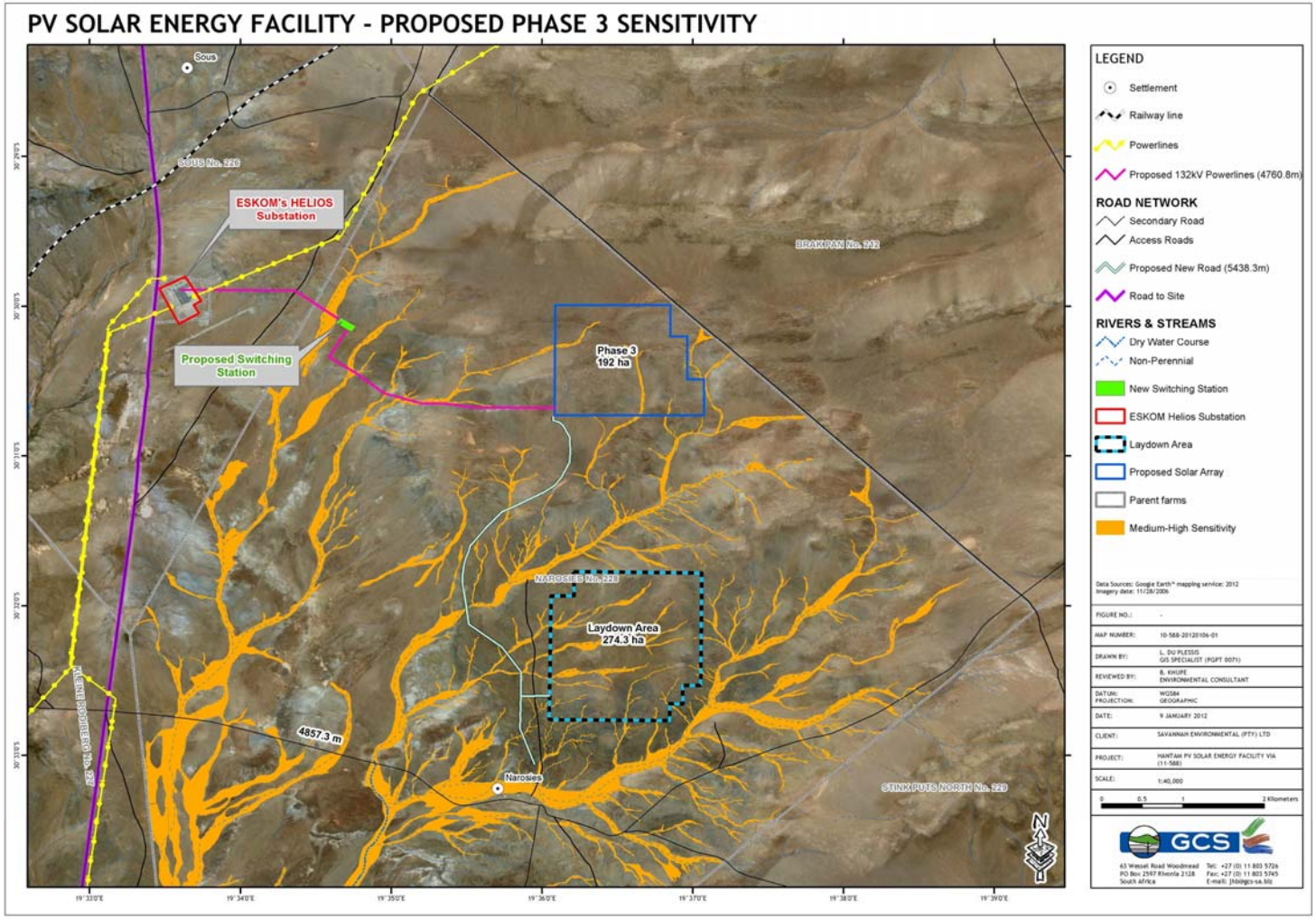

Figure 15.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

15.1. Evaluation of the Proposed Hantam 3 PV Solar Energy Facility

Chapter 8 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 3 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 3 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 3 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 15.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 15.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 3 PV Solar Energy Facilities.

	Hantam 3 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 3 PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 3 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

15.1.1. Local Site-specific Impacts

The construction of the Hantam 3 PV solar energy facility will lead to permanent disturbance of an area of approximately 201.7 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 15.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

15.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

15.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 3 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K3**.

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

15.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 3 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

- All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
- The draft Environmental Management Programme (EMP) as contained within **Appendix K3** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
- Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
- Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
- Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
- Alien invasive plants should be controlled on site.
- A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
- The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

HANTAM 4 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 16

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 4 PV Solar energy facility (DEA ref: 12/12/20/2049/4). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 4 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[34] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 4 PV solar energy facility have been assessed in Chapter 9 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[34] The approach to undertake one consolidated EIA process has been accepted by DEA

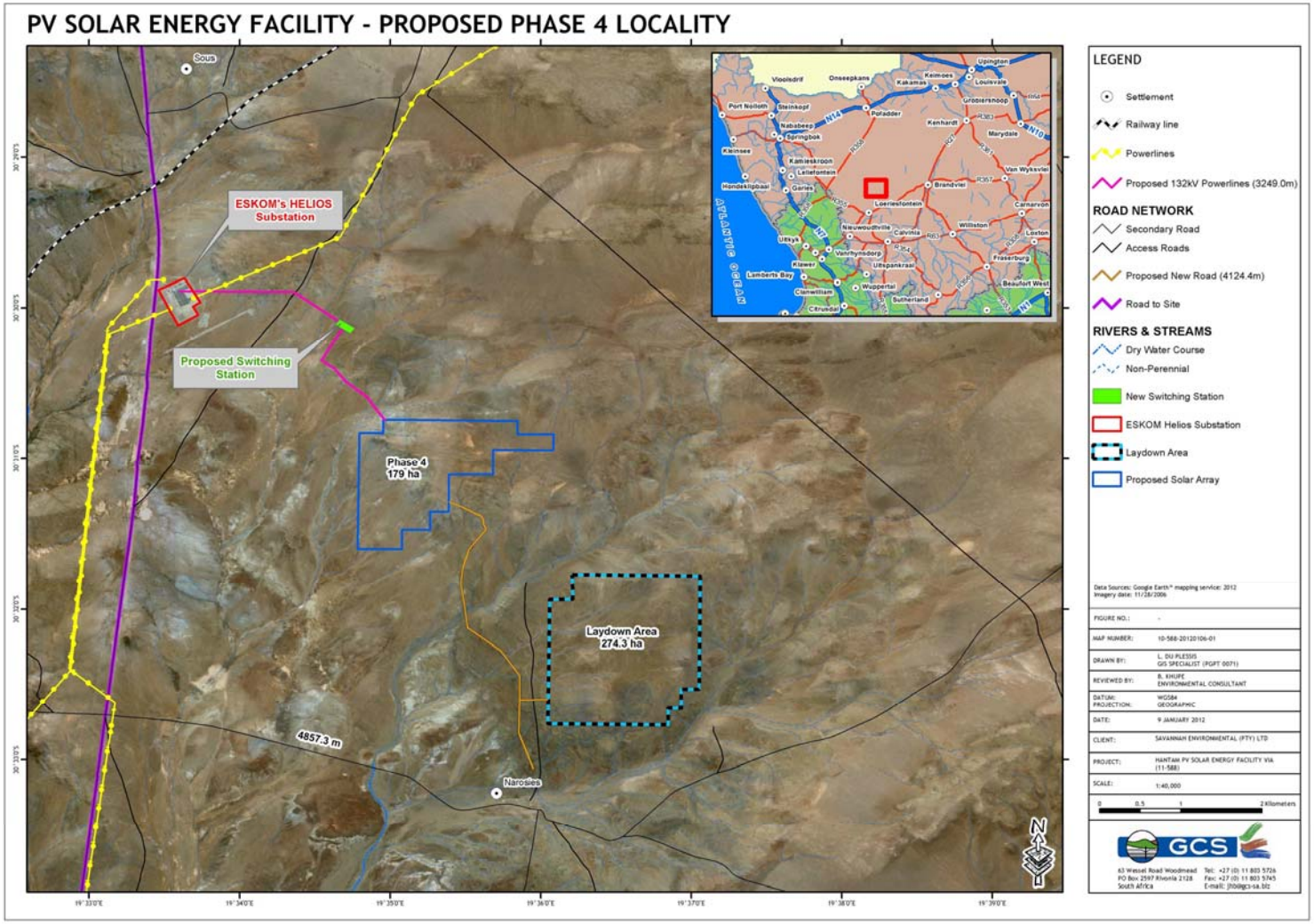

Figure 16.1: Layout of the proposed Hantam 4 PV Solar Energy Facility showing location of the proposed infrastructure

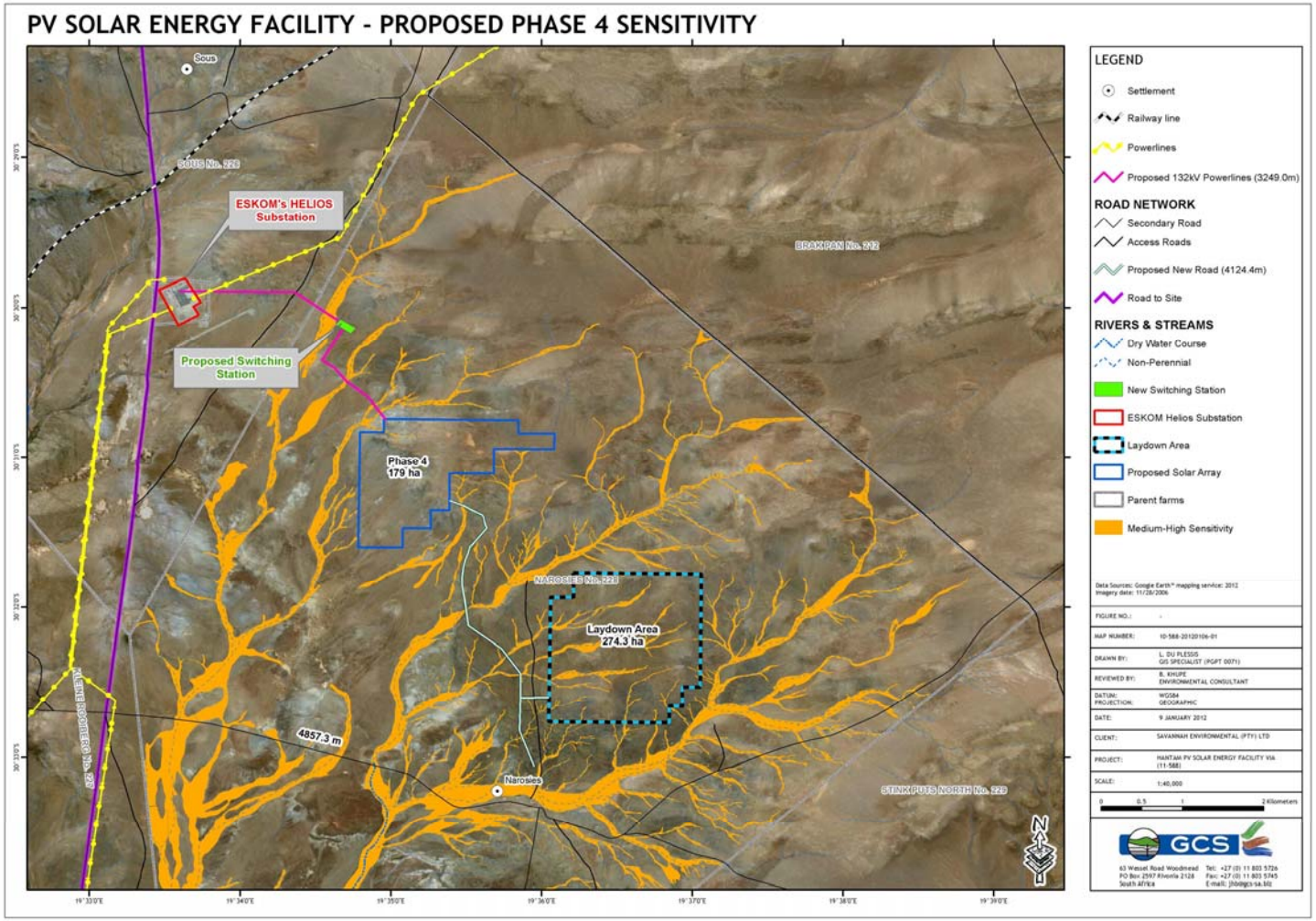

Figure 16.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

16.1. Evaluation of the Proposed Hantam 4 PV Solar Energy Facility

Chapter 9 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 4 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 4 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 4 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 16.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 16.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 4 PV Solar Energy Facilities.

	Hantam 4 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 4 PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 4 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

16.1.1. Local Site-specific Impacts

The construction of the Hantam 4 PV solar energy facility will lead to permanent disturbance of an area of approximately 186.7 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 16.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

16.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

16.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 4 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K4**.

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

16.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 4 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

» All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Programme (EMP) as contained within **Appendix K4** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
» Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
» Alien invasive plants should be controlled on site.
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

HANTAM 5 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 17

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 5 PV Solar energy facility (DEA ref: 12/12/20/2049/5). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 5 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[35] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 5 PV solar energy facility have been assessed in Chapter 10 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[35] The approach to undertake one consolidated EIA process has been accepted by DEA

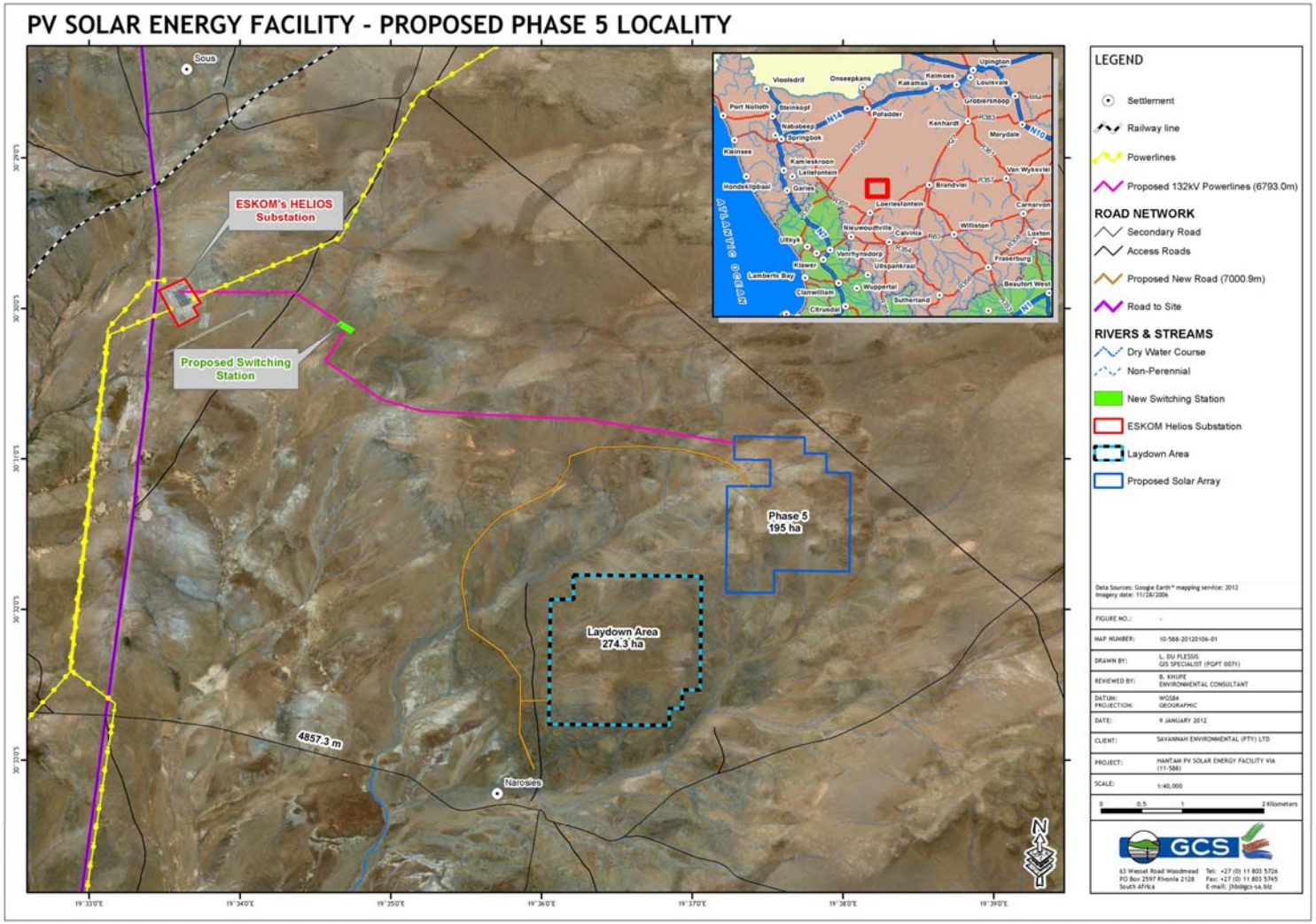

Figure 17.1: Layout of the proposed Hantam 5 PV Solar Energy Facility showing location of the proposed infrastructure

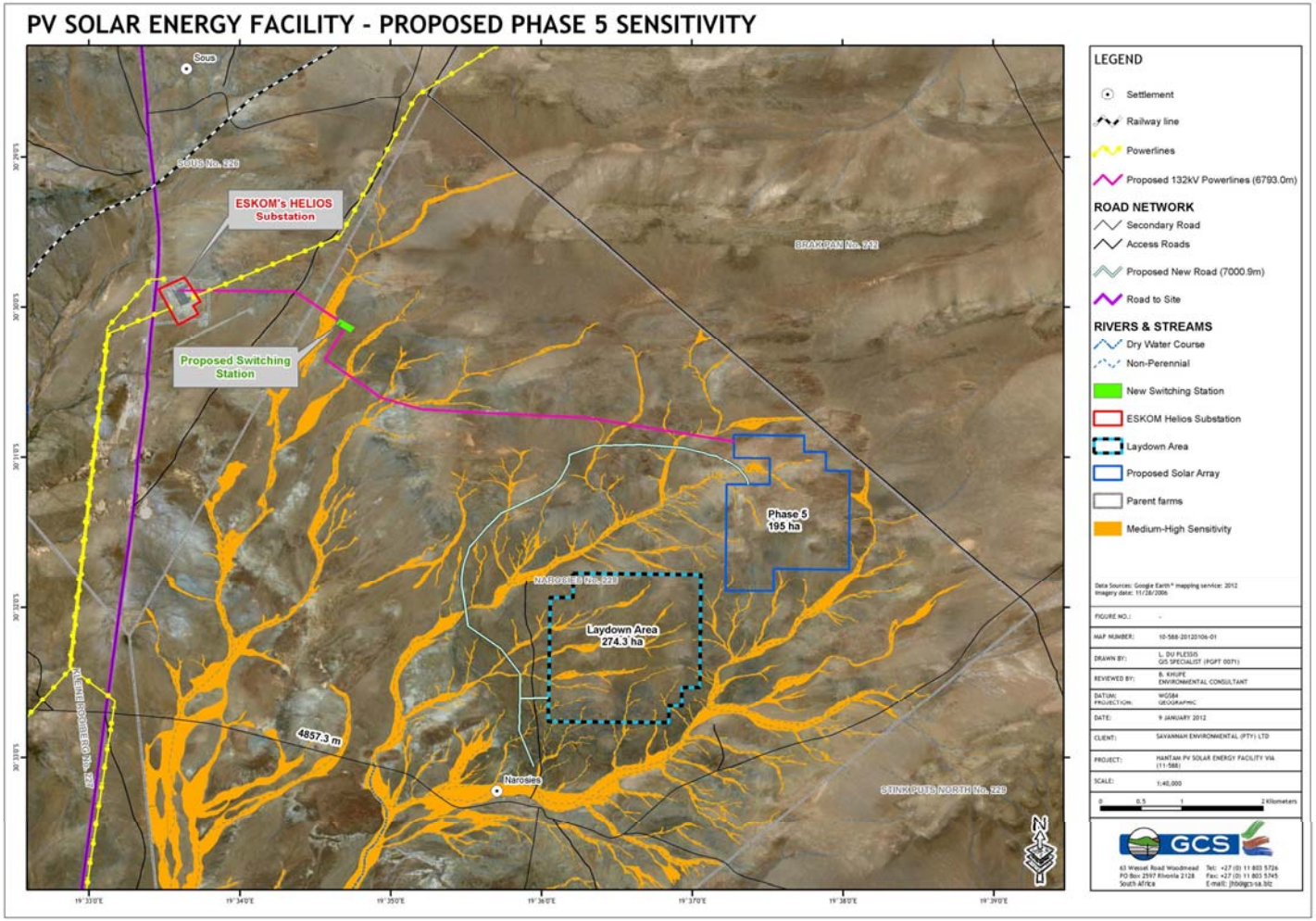

Figure 17.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

17.1. Evaluation of the Proposed Hantam 5 PV Solar Energy Facility

Chapter 10 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 5 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 5 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 5 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 17.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 17.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 5 PV Solar Energy Facilities.

	Hantam 5 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 5 PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 5 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

17.1.1. Local Site-specific Impacts

The construction of the Hantam 5 PV solar energy facility will lead to permanent disturbance of an area of approximately 205.9 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 17.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

17.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

17.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

- The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
- Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
- The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
- On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
- The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 5 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K5**.

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

17.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 5 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

» All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Programme (EMP) as contained within **Appendix K5** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
» Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
» Alien invasive plants should be controlled on site.
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

HANTAM 6 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 18

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 6 PV Solar energy facility (DEA ref: 12/12/20/2049/6). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 6 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[36] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 6 PV solar energy facility have been assessed in Chapter 11 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[36] The approach to undertake one consolidated EIA process has been accepted by DEA

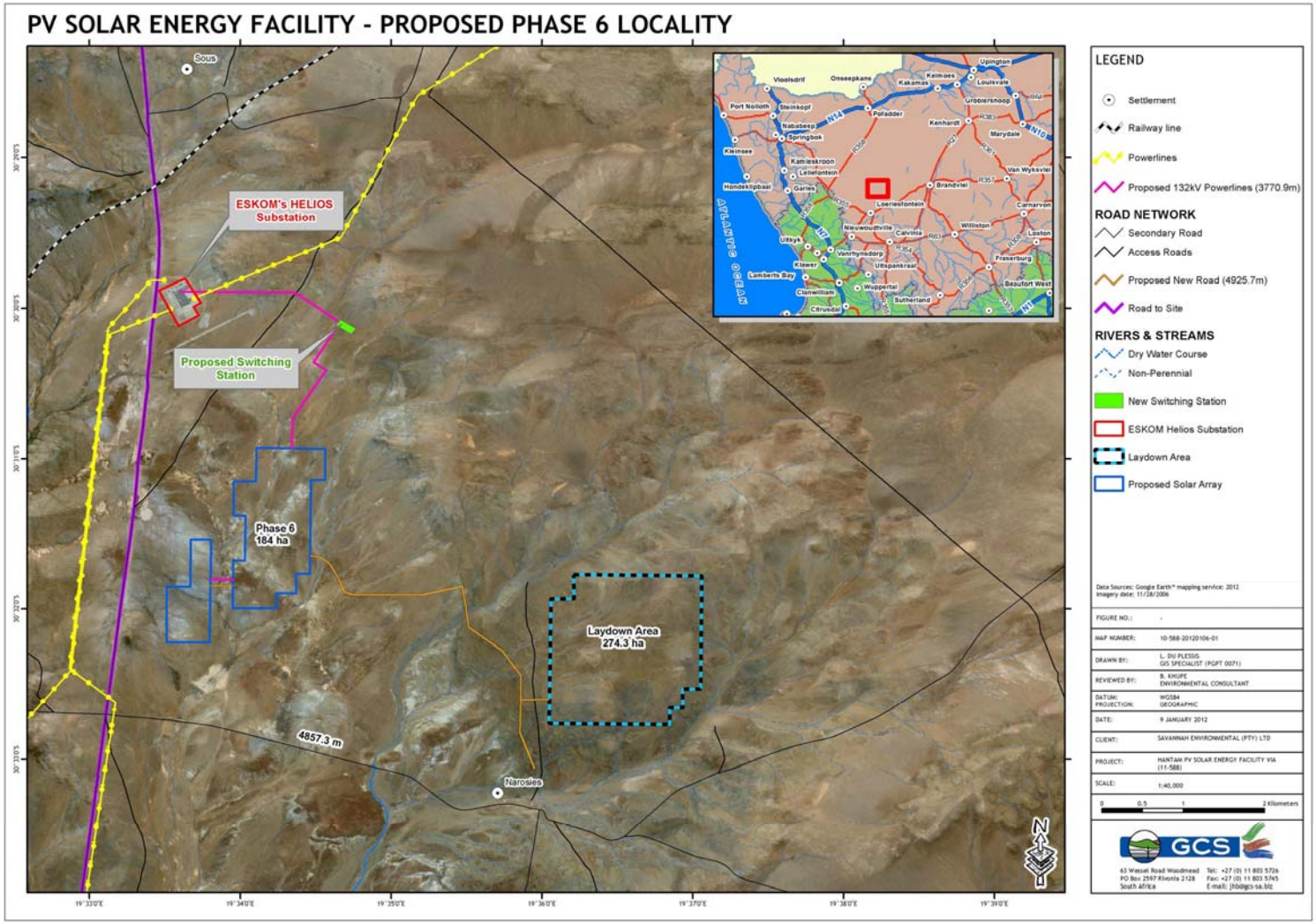

Figure 18.1: Layout of the proposed Hantam 6 PV Solar Energy Facility showing location of the proposed infrastructure

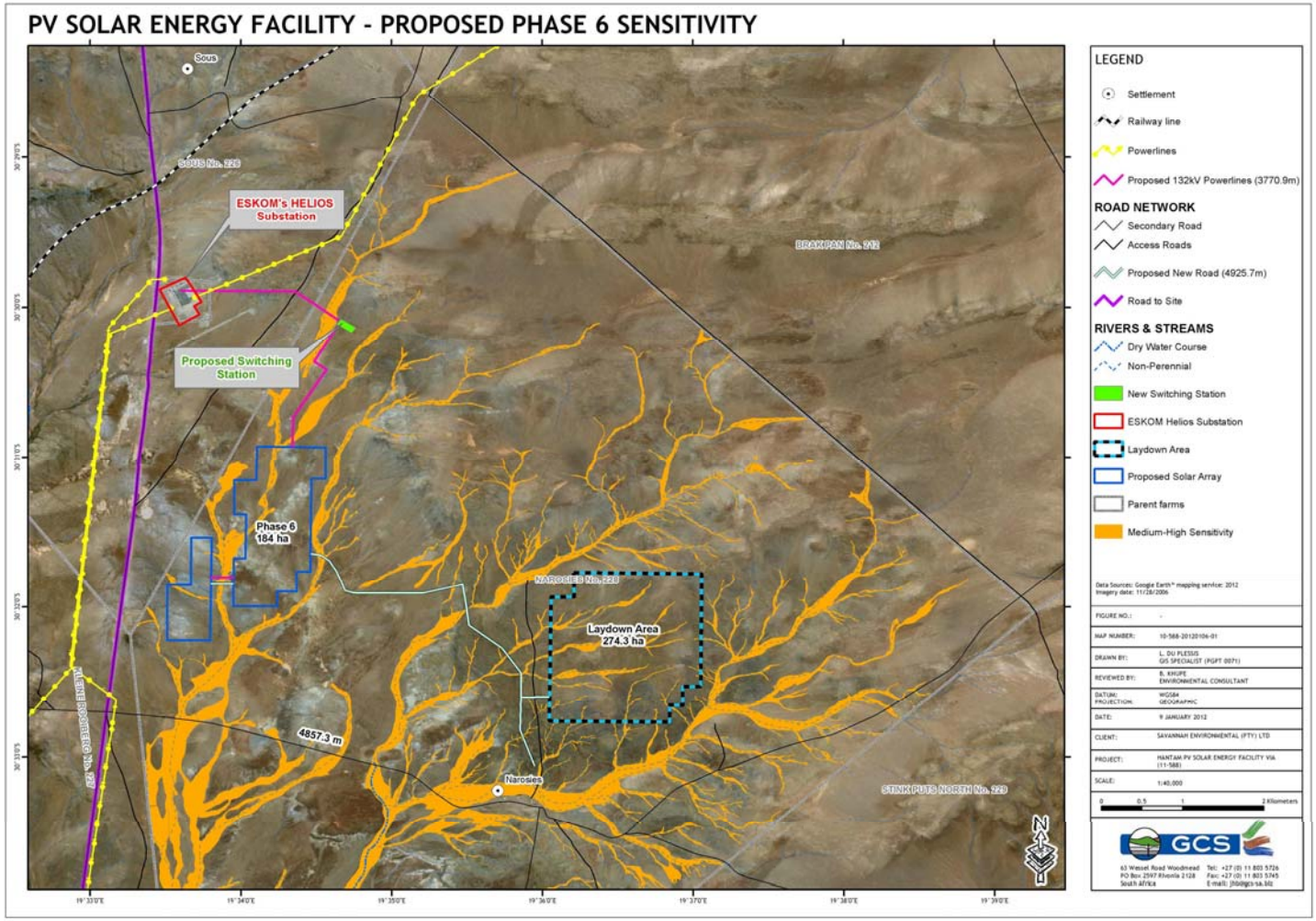

Figure 18.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

18.1. Evaluation of the Proposed Hantam 6 PV Solar Energy Facility

Chapter 11 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 6 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 6 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 6 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 18.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 18.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 6 PV Solar Energy Facilities.

	Hantam 6 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 6 PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 6 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

18.1.1. Local Site-specific Impacts

The construction of the Hantam 6 PV solar energy facility will lead to permanent disturbance of an area of approximately 203 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 18.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

18.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

18.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 6 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K6**.

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

18.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 6 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

» All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Programme (EMP) as contained within **Appendix K6** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
» Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
» Alien invasive plants should be controlled on site.
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

HANTAM 7 PV SOLAR ENERGY FACILITY: CONCLUSIONS AND RECOMMENDATIONS CHAPTER 19

Solar Capital (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site approximately 47 km north of Loeriesfontein in the Northern Cape Province. The study area is situated within the jurisdiction of the Hantam Local Municipality. The full extent of the facility will be referred to as the **Hantam PV Solar Energy Facility** and will have a generating capacity of up to **525 MW**, and will be developed in seven (7) phases.

The facility is to be developed in seven phases under seven separate Special Purpose Vehicles (SPVs). Therefore, in order to accommodate the end-requirement that each SPV receive an Environmental Authorisation for their respective phase (i.e. in order to accommodate the requirements of the RfP issued by the Department of Energy) the proposed development has been split into the following phases:

» Hantam 1 PV Solar Energy Facility, DEA ref: 12/12/20/2049/1
» Hantam 2 PV Solar Energy Facility, DEA ref: 12/12/20/2049/2
» Hantam 3 PV Solar Energy Facility, DEA ref: 12/12/20/2049/3
» Hantam 4 PV Solar Energy Facility, DEA ref: 12/12/20/2049/4
» Hantam 5 PV Solar Energy Facility, DEA ref: 12/12/20/2049/5
» Hantam 6 PV Solar Energy Facility, DEA ref: 12/12/20/2049/6
» Hantam 7 PV Solar Energy Facility, DEA ref: 12/12/20/2049/7

An area of 6764 ha in extent (entire farm portion) was identified for investigation at the start of the EIA process, however the preliminary layout indicates that an area of 1338 ha would be potentially impacted on by all 7 phases of the proposed development.

The conclusions and recommendations presented in this chapter are applicable to the Hantam 7 PV Solar energy facility (DEA ref: 12/12/20/2049/7). The proposed solar energy facility is to make use of photovoltaic (PV) technology and will be comprised of the following infrastructure:

» An array of **photovoltaic panels** which will be developed in phases.
» **Support structures** to mount the photovoltaic panels.
» New overhead distribution power lines
» **Invertors** and **cabling** between project components
» An on-site **substation**
» An on-site **switching station**
» **Access roads** (to use one existing track and construct one new one)

» Temporary **laydown** and **storage areas** to be shared by all phases of the proposed development**.**

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). As the proposed Hantam 7 PV solar energy facility forms part of a larger solar energy facility development, a consolidated EIA process[37] has been undertaken with a single EIA report being produced to assess the potential environmental impacts associated with the larger development, as well as the potential cumulative impacts of all the seven proposed phases. Potential impacts associated with the Hantam 7 PV solar energy facility have been assessed in Chapter 12 of this report. The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

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

[37] The approach to undertake one consolidated EIA process has been accepted by DEA

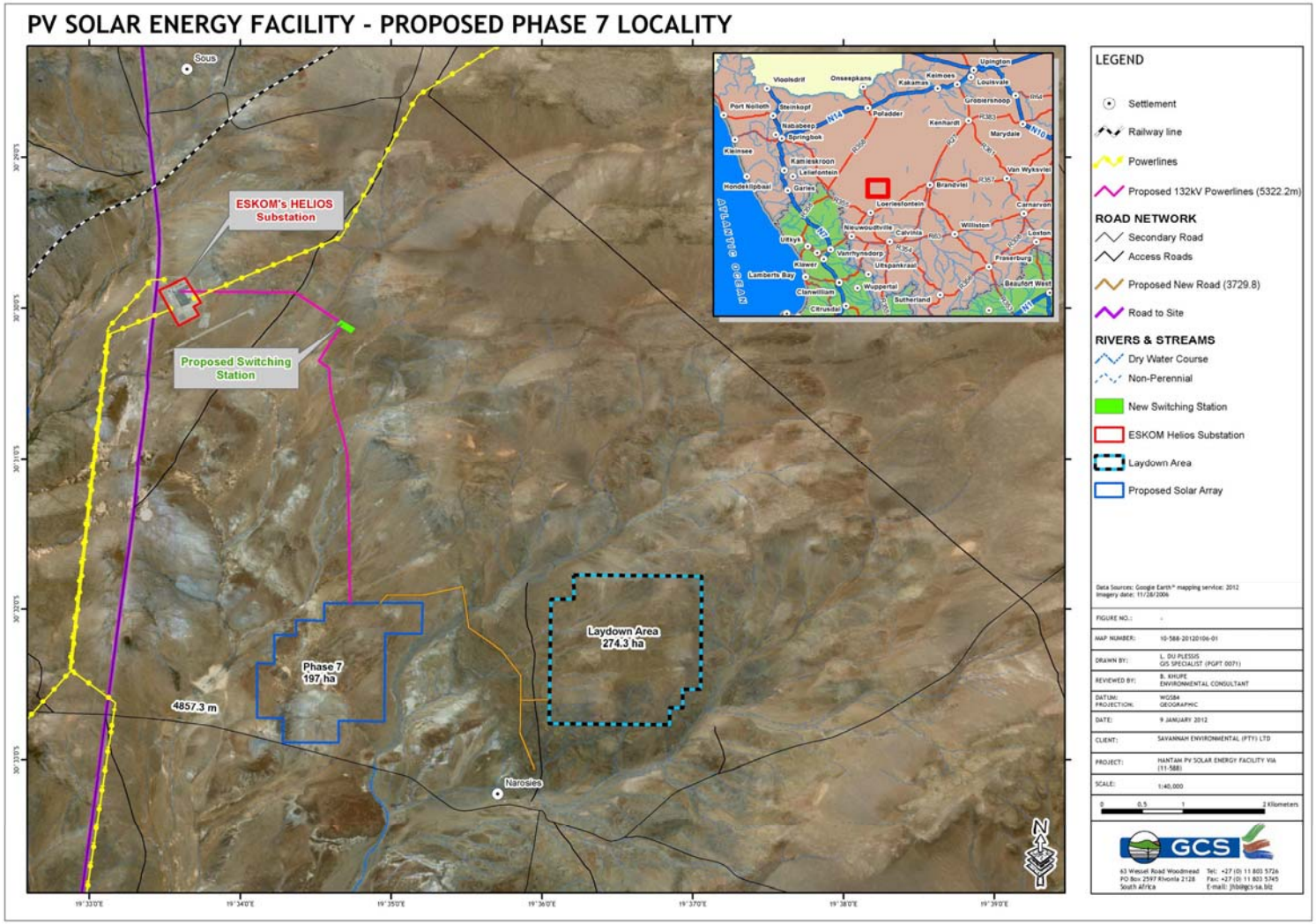

Figure 19.1: Layout of the proposed Hantam 7 PV Solar Energy Facility showing location of the proposed infrastructure

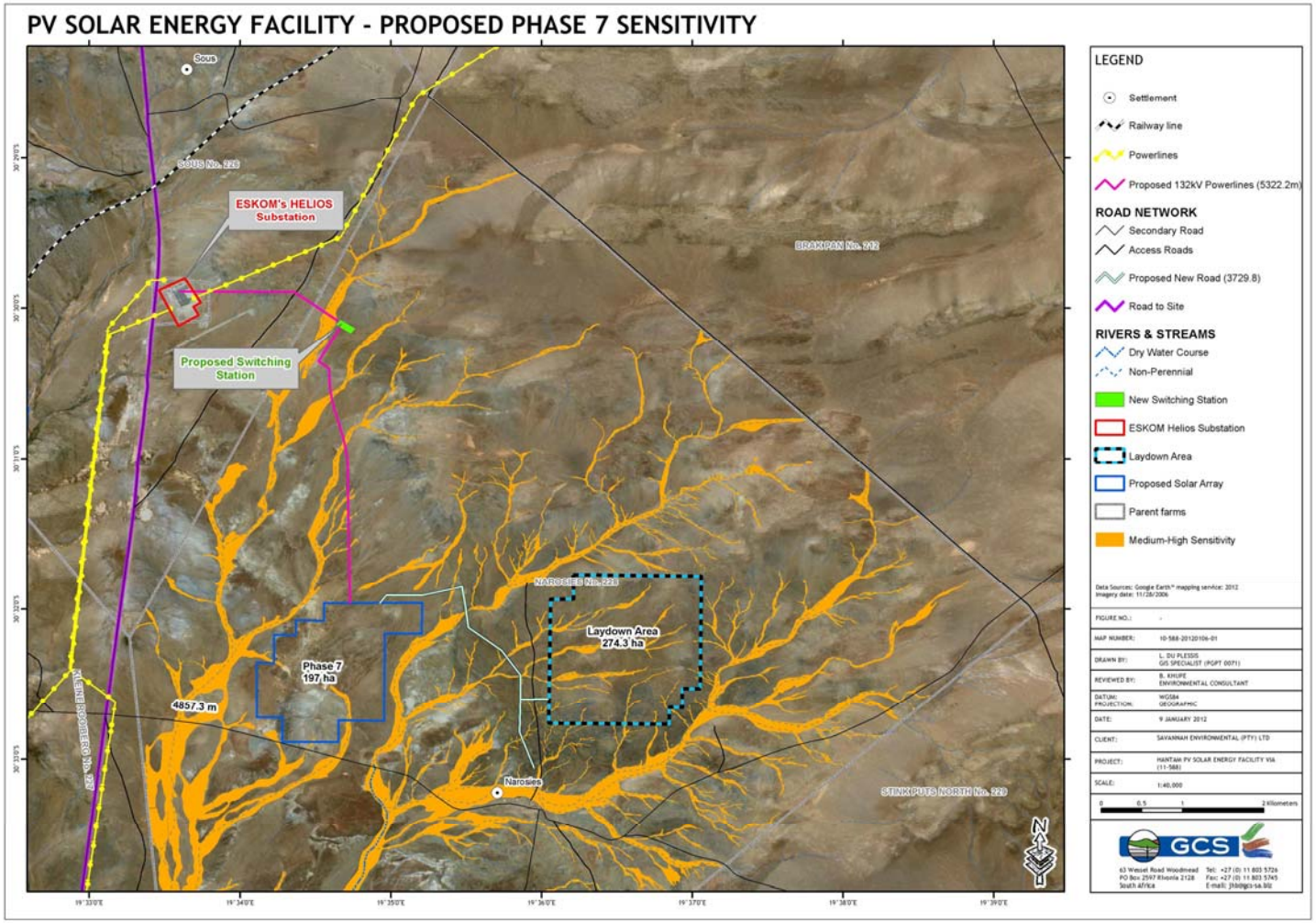

Figure 19.2: Sensitivity map illustrating the sensitive areas across the site, in relation to the proposed layout for the proposed development

19.1. Evaluation of the Proposed Hantam 7 PV Solar Energy Facility

Chapter 12 of this report together with the specialist studies contained within Appendices F - K provide a detailed assessment of the potential impacts that may result from the proposed Hantam 7 PV solar energy facility. This chapter concludes the EIA reporting for the Hantam 7 solar energy facility by providing a summary of the conclusions of the assessment of the proposed site for the Hantam 7 facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA include:

» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Impacts on the social environment.

Table 19.1 below gives a summary of the potential impacts identified and assessed through the EIA process as well as their impact rating before and after mitigation.

Table 19.1: Summary of All Impacts

The following table provides a summary of the potential impacts identified and assessed through the EIA process with and without mitigation for the proposed Hantam 7 PV Solar Energy Facilities.

	Hantam 7 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
Impacts on Ecology		
Loss of habitat within indigenous natural vegetation types	Low - Medium	Low - Medium
Impacts on individuals of protected plant species (Hoodia gordonii)	Low	Low
Impacts on individuals of threatened animal species	Low	Low
Damage to wetland areas resulting in hydrological impacts	Medium	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Medium	Low
Bird collisions with power lines	Low	Low
Impacts on soils and agricultural potential		
Disturbance of soils and impacts on existing land use due to construction of PV facility and associated infrastructure	Medium	Medium
Disturbance of soils and impacts on existing land use due to construction of roads	Medium	Medium
Physical and chemical degradation (hydrocarbon spills) of the soil by construction vehicles	Low	Low
Impact of dust generation on site	Low	Low
Loss of agricultural potential and land capability owing to the construction of the PV panels, access roads, buildings and other infrastructure.	Low	Low
Potential Heritage Impacts		
Disturbance of surfaces and/or sub-surfaces containing artefacts resulting in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object.	Low	Low
Potential Visual Impacts		
Visual impact of the proposed Hantam 7 PV solar energy facility and associated infrastructure	Medium	Medium
Potential Social Impacts		
Creation of employment and business	Medium (positive)	High (positive)

	Hantam 7 PV Solar Energy Facility	
Nature	***Without mitigation***	***With mitigation***
opportunities during the construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers	Low (for whole community)	Low (for whole community)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Low (for whole community)	Low (for whole community)
Potential impact on local farmers associated with loss of farm labour to the construction phase	Low	Low
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low	Low
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium	Low
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	Low	Low
Impact on farmland due to construction related activities	Medium	Low
Creation of employment and business opportunities associated with the operational phase	Medium (positive)	High (positive)
Promotion of clean, renewable energy	Medium (positive)	High (positive)
Potential loss of productive agricultural land associated with the facility footprint and associated potential impact on viability of operations during operational phase	Medium	Low
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place	Medium	Low
Potential impact of the facility on local tourism	Low (positive and negative)	Low (positive and negative)
Potential visual impact and impact on sense of place associated with power lines	Low	Low

19.1.1. Local Site-specific Impacts

The construction of the Hantam 7 PV solar energy facility will lead to permanent disturbance of an area of approximately 205.2 ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line routes and the access roads. From the specialist investigations undertaken for the proposed solar energy facility development site, limited 'no go' areas and areas of high sensitivity were identified (refer to the sensitivity map - Figure 19.2). These potentially sensitive areas include:

» **Drainage lines within the site**

The Bushmanland Basin Shrubland vegetation type is the main vegetation type that occurs on site. This vegetation type is classified as Least Threatened and also has a wide distribution and extent. Local factors that may lead to parts of the study area having high ecological sensitivity are the presence of drainage lines on site and the potential presence of various plant and animal species of conservation concern. The drainage lines will potentially be impacted by the proposed power line and access roads (linear infrastructure panned for the site), and not the areas to be occupied by the PV panels. However, the power line can span the drainage line and would easily be outside the recommended 32 m buffer.

In order to minimise potential impacts during construction on these no-go areas and potentially sensitive areas within the site, the following recommendations have been made:

» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines).
» The construction impacts must be contained to the footprint of the infrastructure.
» Only the centre line of the power line servitude should be cleared. Remaining parts of the servitude must be left intact.
» Avoid impacts on natural habitats outside the footprint of the proposed infrastructure.

19.1.2 Impacts on the Social Environment

The study area is largely agricultural in nature, and few farmsteads and homesteads occur around the site. The site is located in a remote/rural area of the Northern Cape with a few homesteads around it.

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

No construction crew camp will be established on the site, and construction workers will be housed in the town of Loeriesfontein or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours, and the construction phase (for each phase of the proposed development) is anticipated to extend for a minimum 12-month period. Negative impacts during construction relate mainly to impacts due to presence of construction workers and visual impact imposed by the facility on the local environment. There will be a positive impact due to employment creation, which is a much needed relief by the town of Loeriesfontein (which has very high unemployment levels). The positive impact due to employment creation will be lower than during operation as there will be a limited number of staff required compared to the construction phase. The potential social negative impacts of the proposed development are offset by the potential positive impacts.

19.2. Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area include the:

» Hantam Local Municipality Integrated Development Plan (IDP) (2011-2012).
» Namakwa District Municipality Integrated Development Plan (IDP) (2006 – 2011 (Fourth revision 2011/2012)).
» Northern Cape Provincial Growth and Development Strategy (2004-2014).

The viability of establishing a solar plant on a site near Loeriesfontein has been established by Solar Capital. The positive implications of establishing a solar energy facility on the identified site include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» Solar facilities have an advantage over other more conventional power generating facilities (e.g. coal-fired power stations). The facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks. In addition, PV facilities have a lower visual impact compared wind energy facilities.
» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise, no emissions etc).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed **Hantam 7 PV Solar Energy Facility** conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within **Appendix K7**.

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

19.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the proposed Hantam 7 PV Solar

Energy Facility can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

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

» All mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Programme (EMP) as contained within **Appendix K7** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
» Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
» Where drainage lines are required to be crossed by access roads, the relevant permits (or water use licences) must be applied for from the DWA.
» Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the watercourses).
» Alien invasive plants should be controlled on site.
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

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