ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT SCOPING REPORT

PROPOSED KLIP GAT SOLAR ENERGY FACILITY (75MW) NEAR NOUPOORT, NORTHERN CAPE PROVINCE
DEA Ref. No: 14/12/16/3/3/2/354

DRAFT SCOPING REPORT FOR PUBLIC REVIEW

08 August 2012 – 08 September 2012

Prepared for:

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/354
Title	:	Environmental Impact Assessment Process Draft Scoping Report: Proposed Klip Gat Solar Energy Facility (75mw) Near Noupoort, Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Umeshree Naicker Ravisha Ajodhapersadh Karen Jodas
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Client	:	Klip Gat Solar Energy (Pty) Ltd
Report Status	:	Draft Scoping Report for Public Review
Review Period	:	08 August 2012 – 08 September 2012

When used as a reference this report should be cited as: Savannah Environmental (2012) Draft Scoping Report: Proposed Klip Gat Solar Energy Facility near Noupoort, Northern Cape Province

PURPOSE OF THE SCOPING REPORT

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility (75 MW) on a site located approximately 20 km north west of Noupoort, Northern Cape Province. The project is known as the **Klip Gat Solar Energy Facility (75MW)** (Figure 1.1). The solar energy facility is proposed to accommodate **Photovoltaic (PV) panel** technology.

Klip Gat Solar Energy (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) for the proposed facility. The EIA process is being undertaken in accordance with the requirements of the EIA Regulations of June 2010 (of GNR543) promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

This Draft Scoping Report represents the findings of the Scoping Phase of the EIA process and contains the following sections:

» **Chapter 1** provides background to the proposed solar energy facility and the environmental impact assessment process.
» **Chapter 2** describes the components of the proposed project.
» **Chapter 3** outlines the process which was followed during the Scoping Phase of the EIA process.
» **Chapter 4** describes the existing biophysical and socio-economic environment affected by the proposed project.
» **Chapter 5** provides a desktop assessment of the potential environmental and social impacts associated with the two development phases of the proposed project.
» **Chapter 6** presents the conclusions of the scoping evaluation.
» **Chapter 7** describes the Plan of Study for EIA.
» **Chapter 8** provides references used in the compilation of this Scoping Report.

INVITATION TO COMMENT ON THE DRAFT SCOPING REPORT

This **Draft Scoping Report** has been made available for public review at the following places, which lie in the vicinity of the proposed project area from **08August 2012 - 08 September 2012:**

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» Naauw Poort Public Library
» Hanover Public Library

The report is also available for download on:

» www.savannahsa.com

Please submit your comments to
Gabriele of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011 234 6621 Fax: 086 684 0547 Email: gabriele@savannahsa.com
The due date for comments on the Draft Scoping Report is **08 September 2012**

Comments can be made as written submission via fax, post or e-mail.

EXECUTIVE SUMMARY

Background

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility (75 MW) on a site located approximately 20 km North West of Noupoort, Northern Cape Province. The project is known as the **Klip Gat Solar Energy Facility (75MW)**

Based on a pre-feasibility analysis and site identification process undertaken by Klip Gat Solar Energy (Pty) Ltd, a favourable area has been identified for consideration and evaluation through an environmental impact assessment process. The study area is situated within the jurisdiction of the Emthangeni Local Municipality.

The **Klip Gat Solar Energy Facility** so is proposed to accommodate several arrays of photovoltaic (PV) panels and associated infrastructure. From a regional perspective, this region of the Northern Cape Province is preferred by virtue of its climatic conditions (primarily due to the economic viability of a solar energy facility being directly dependent on the annual direct solar irradiation values for a particular area). From a local perspective, the site is preferred due to suitable topography, grid connection (to connect to the existing Linde Carolus 132 kV power line) access, and by virtue of the extent of the site.

An EIA process and public participation process is being undertaken for the proposed project. The nature and extent of this facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this Draft Scoping Report.

Project Location

The PV solar energy facility and associated infrastructure is proposed on Portion 2 of Farm Klip Gat 80. The farm is situated approximately 20 km North West of Noupoort, Northern Cape Province.

Project Components

The proposed facility is envisaged to make use of **photovoltaic (PV)** technology with a maximum total installed capacity of **~75 MW** and will include the following infrastructure:

» An array of photovoltaic (PV) panels.
» A new on-site substation to evacuate the power from the facility into the Eskom.
» The substation is proposed to be connected via a loop-in loop-out connection to the existing Linde Carolus 132 kV power line or there will be an upgrade or construction of a new power line.

- Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
- Cabling between the project components, to be lain underground where practical.
- Internal access roads and fencing.
- Workshop area for maintenance, storage, and offices

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

Evaluation of the Proposed Project

The main issues identified through this scoping study associated with the proposed solar energy facility are summarised in Table 1 below.

As can be seen from this table, the majority of potential impacts identified to be associated with the construction of the solar energy facility are anticipated to be localised and restricted to the proposed site itself (apart from social impacts – job creation which could have more of a regional positive impact; and visual impacts which would extend beyond the site boundaries), while operational phase impacts range from local to regional and national (being the positive impact of contribution of clean energy as part of the energy mix in South Africa; and visual impacts which would extend beyond the site boundaries).

Table 1: Summary of significance of the potential impacts associated with the proposed PV solar energy facility development

Construction / Decommissioning Impacts	Extent
Re-establishment of natural vegetation	L
Spread of declared weeds and alien invasive species	L-R
Re-colonisation of habitats	L
The potential impact of change in drainage patterns in the area as a result of development and its effect on the drainage system	L-R
Loss of arable land	L
Interference with agricultural important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.)	L
Soil degradation due to accelerated erosion (water or wind)	L
Soil degradation due to contamination	L
Soil erosion due to increased and concentrated storm water run-off	L
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	L
Siltation of watercourses and other natural resources downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off	R
Degradation of (seasonal wash) watercourses	R
Dust production	L
Loss or destruction of Archaeological sites	L
Loss or destruction of Palaeontological sites/ fossils	L
Visual impacts during construction	R
Temporary job creation during construction phase	L-R
Economic spin-offs to local community.	L
Influx of people into the study areas including members of the construction crews and job seekers	L
Skills development	L-R
Security issues	L
Disturbance of surrounding landowners	L
Operational Impacts	Extent
Re-establishment of natural vegetation	L

Spread of declared weeds and alien invasive species	L-R
Re-colonisation of habitats	L
The potential impact of change in drainage patterns in the area as a result of development and its effect on the drainage system	L-R
Long term loss of arable land	L
Soil erosion	L
Potential visual impact of the proposed facilities on sensitive observers beyond 3 km from the project site	L
Change in character of the prevailing use of the area	L
Introduction of artificial light sources in a rural landscape	L
Reflection of the PV panels on the sensitive receptors in the region	L
Employment opportunities	L-R
Safety and security impacts on the site and surrounds	L
Contribution of clean energy	N

L **Local** R **Regional** N **National** I **International**

The potential ecological sensitivity areas that have been identified for further study include:

» **Ecologically sensitive areas (terrestrial)** within the site:

» **Erosion sensitivity of the soils on the site**
The soils on the site have a low susceptibility to water erosion and a portion of the site (the south-western edge of the site) is of moderate susceptibility to water erosion. The area that is of moderate susceptibility may consist of gentle slopes/ ridges.

» **Heritage Artefacts – Scatters and Stone Wall**
Two archaeological sites (stone artefacts) were identified and included: Klip Gat 1 and Klip Gat 2.
The areas around sites Klip Gat 1 and Klip Gat 2 are marked on the map (Figure 6.1) and are considered to be sensitive from an archaeological point of view.

» **Socially sensitive areas:**
The only relevant view corridor is that of a minor farm road, which runs parallel to the De Aar – Noupoort railway line, north of the project site. This is referred to as KOP 1. KOP1 is situated on the farm access road, north of the project site. The sparse natural veldt result in general good visibility from this particular point. The home stead / visual receptor is identified as KOP 8. KOP8 represents the observation point closest to the project site, at some 1.95km. This observation point is therefore located in the middle ground of the project. Nevertheless, due to the relatively sparse natural vegetation on site, the viewer has an unobtrusive view of the project site.

These potentially sensitive areas are shown in Figure 1 below. These areas are based on a desktop analysis of existing information and will, therefore, be further investigated and assessed through a detailed specialist study (including field surveys) during the EIA phase of the process in order to confirm their sensitivity.

In order to assess potential impacts within sensitive areas, the preliminary layout for the PV solar energy facility will be considered in the EIA phase. This preliminary sensitivity analysis of the site should be considered by BioTherm Energy (Pty) Ltd in understanding which areas of the site would be least impacted by the development of a PV solar energy facility in order to inform the preliminary infrastructure layouts for consideration within the EIA phase. Through the EIA phase more detailed studies will be conducted, and sensitive areas will be marked more accurately and in more detail than in this Draft Scoping Report.

Evaluation of the Potential Issues with Associated Infrastructure - Invertors, and Internal Access Roads

In order to connect the Klip Gat solar energy facility to the power grid, the proposed facility is currently planning on connecting to the Linde Carolus 132 kV power line by a loop in and loop power line. Potential issues identified to be associated with a proposed overhead power line, substation, access roads and invertors include impacts on flora, fauna and ecological processes, impacts on avifauna as a result of collisions and electrocutions, potential impacts on heritage sites and visual impacts.

Potential issues identified to be associated with the internal access roads and on-site substation include impacts on flora, fauna and ecological processes, protected sites, where mitigation is required prior to destruction of such heritage sites/ artefacts)and visual impacts. The potential impacts associated the associated infrastructure will be considered in detail within the EIA phase. Recommendations regarding a preferred location for this infrastructure and appropriate mitigation measures (if required) will be made. Other infrastructure such as the internal substation location/s, access roads and the maintenance facility will also be considered in the EIA phase based on the preliminary layout to be provided Klip Gat Solar Energy (Pty) Ltd

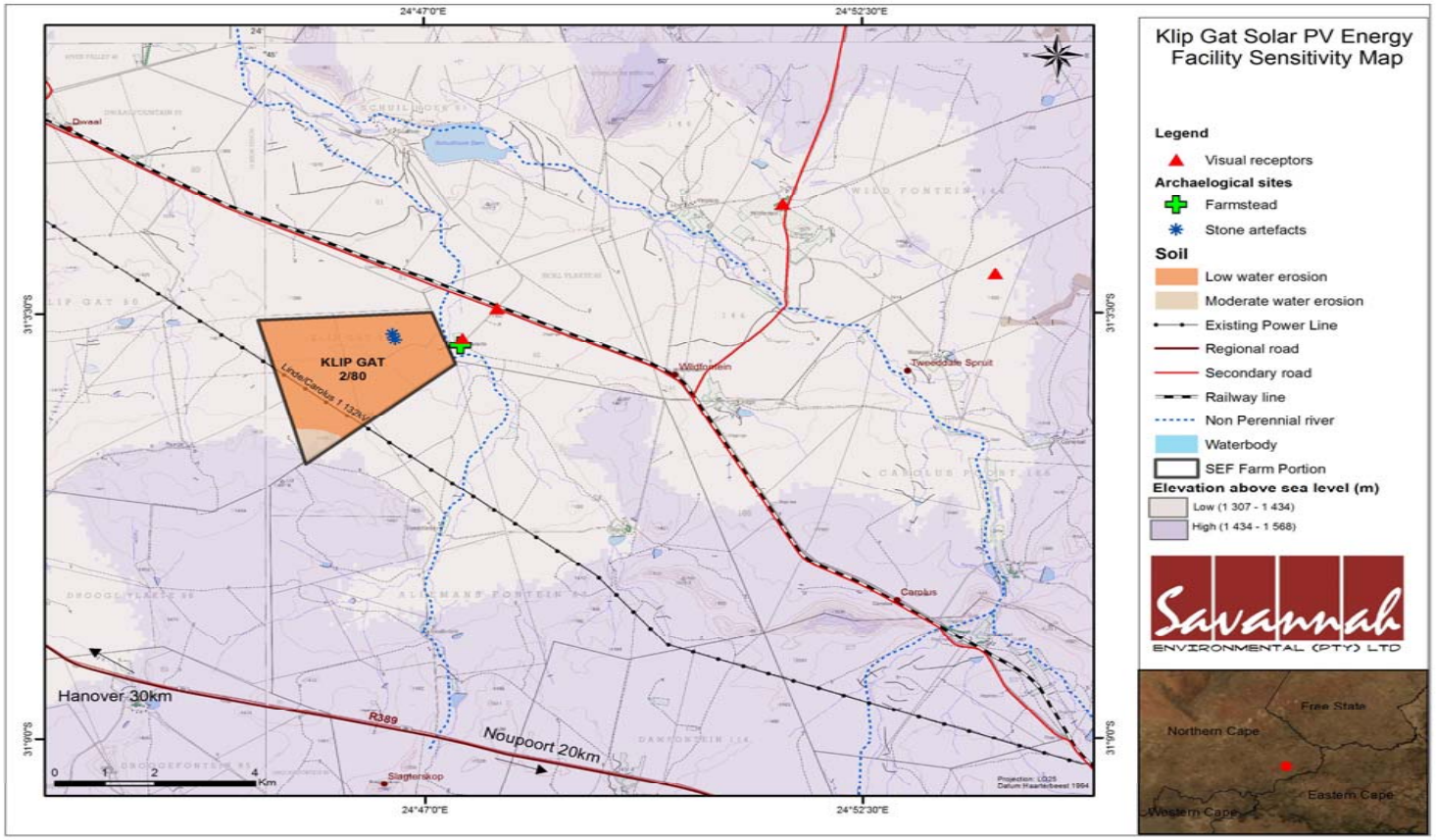

Figure 1: Desktop Environmental Sensitivity Map of the proposed Klip Gat Solar Energy Facility

CONTENTS

INTRODUCTION CHAPTER 1

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility (75 MW) on a site located approximately 20 km north west of Noupoort, Northern Cape Province. The project is known as the **Klip Gat Solar Energy Facility (75MW)** (Figure 1.1).

The solar energy facility is proposed to accommodate several arrays of tracking **photovoltaic (PV) panels** and associated infrastructure. From a regional perspective, this region of the Northern Cape Province is preferred by virtue of its **climatic conditions** (primarily due to the economic viability of a solar energy facility being directly dependent on the annual direct solar irradiation values for a particular area). From a local perspective, the site is preferred due to suitable topography, grid connection (Linde Carolus 132 kV power line) traverses the site), access, and by virtue of the extent of the site.

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

1.1. Project Components

The Klip Gat Solar Energy Facility (75MW) is proposed to be established on Portion 2 of Farm Klip Gat 80. This property falls within the Emthangeni Local Municipality. The identified site can be accessed via the N11 and other secondary roads. The larger site covers an area of approximately 848 hectares which is the extent of the farm portion that is being assessed in the EIA. The development footprint is not precisely known at this stage but will be confirmed during the EIA Phase and is currently estimated to be roughly 30 hectares for each block of 10 MW. The facility can therefore be appropriately placed within the larger site taking environmental and any other identified constraints into consideration.

The proposed facility is envisaged to make use of **photovoltaic (PV)** technology with a maximum total installed capacity of **~75 MW** and will include the following infrastructure:

» An array of photovoltaic (PV) panels
» A new on-site substation to evacuate the power from the facility into the Eskom grid via the Linde Carolus 132 kV power line which traverses the site
» The substation is proposed to be connected via a loop-in loop-out connection to the existing Linde Carolus 132 kV power line or there will be an upgrade or construction of a new power line.

» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling between the project components, to be lain underground where practical.
» Internal access roads and fencing.
» Workshop area for maintenance, storage, and offices.

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

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

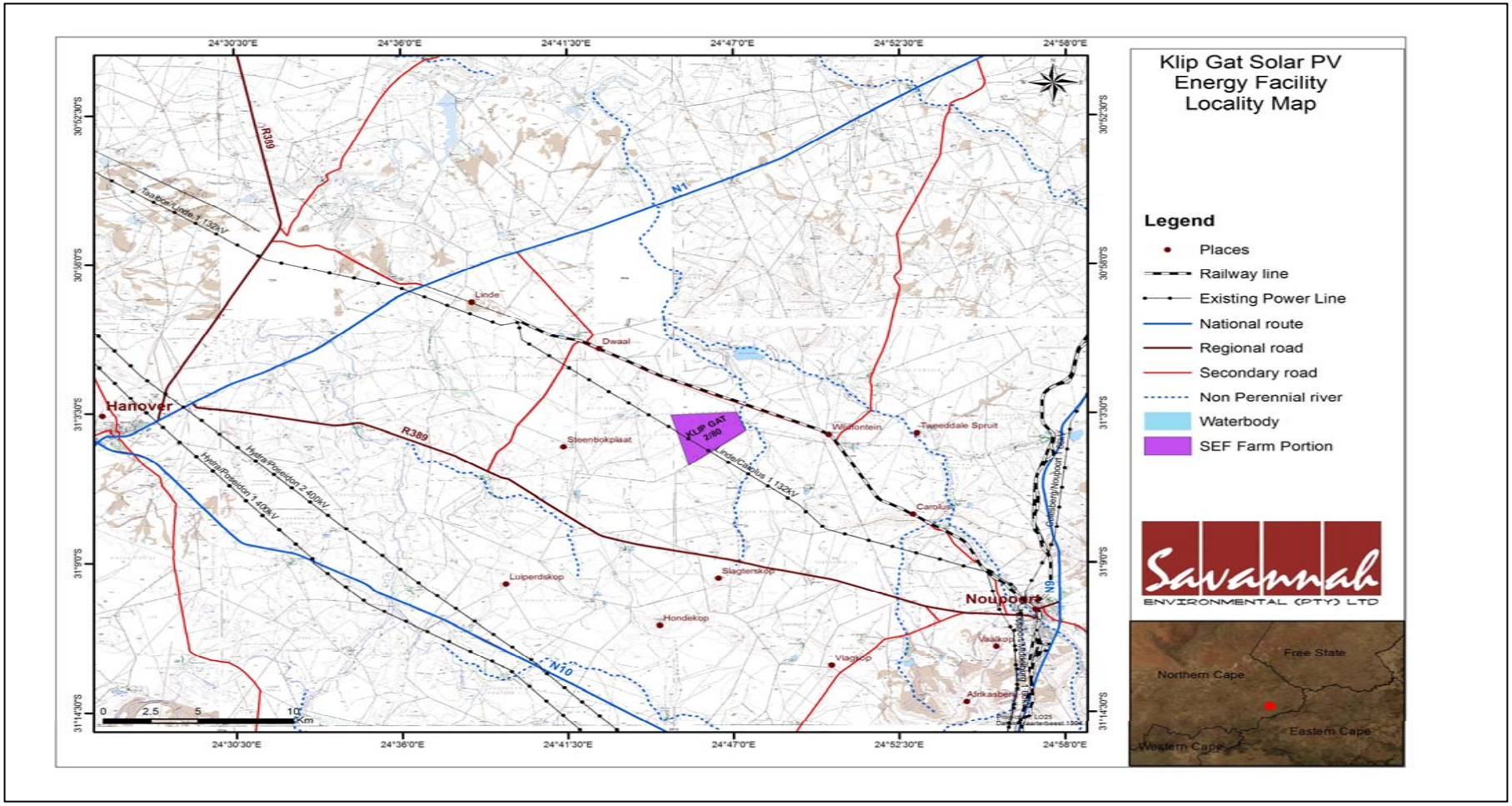

Figure 1.1: Locality Map showing the proposed **Klip Gat Solar Energy Facility (75MW)** to be located on Portion 2 of Farm Klip Gat 80

1.2. The Purpose of the Proposed Project

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

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Klip Gat Solar Energy (Pty) Ltd proposes the establishment of the **Klip Gat Solar Energy Facility** project to add new capacity to the national electricity grid. Klip Gat Solar Energy (Pty) Ltd will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as a power purchase agreement from Eskom (i.e. typically for a period of 20 - 25 years) in order to build and operate the proposed PV facility. As part of the agreement, Klip Gat Solar Energy (Pty) Ltd will be remunerated per kWh by Eskom who will be financially backed by government. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

1.3. Requirement for an Environmental Impact Assessment Process

The proposed solar energy facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 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 that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environmental and Nature Conservation (DENC) will act as a commenting authority. An application for authorisation has been accepted by DEA under application reference number 14/12/16/3/3/2/354.

The need to comply with the requirements of the EIA Regulations ensures that the competent authority is provided with the 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 Klip Gat Solar Energy (Pty) Ltd appointed Savannah Environmental as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA process for the proposed project.

An EIA is also 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 opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with interested and affected parties (I&APs).

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543; GNR544; GNR545; and GNR546 as amended in December 2010, the following 'listed activities' are triggered by the proposed solar energy facility include:

Indicate the number and date of the relevant notice:	**Activity No (s) (in terms of the relevant notice):**	**Describe each listed activity as per project description**
GN 544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – i. Outside urban areas or industrial complexes with a capacity of more than 33kv but less than 275kv; or ii. Inside urban areas or industrial complexes with a capacity of 275kv or more. *The facility will require the construction of an overhead distribution power line, connecting to the Linde Carolus 132 kV line power line which traverses the site.*
GN 544, 18 June 2010	11	The construction of: ~~i. Canals;~~ ~~ii. Channels;~~ ~~iii. Bridges;~~ ~~iv. Dams;~~ ~~v. Weirs;~~ ~~vi. Bulk stormwater outlet structures;~~ ~~vii. Marinas;~~ ~~iii. Jetties exceeding 50 square metres in size~~ ~~ix. Slipways exceeding 50 square metres in size~~ 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 *Buildings exceeding 50 m² may be required to be built with 32 m of a watercourse. (excluding the items that have been deleted).*
GN 544, 18 June 2010	18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from: i. A watercourse; ~~ii. The sea;~~ ~~iii. The seashore;~~ ~~iv. The littoral active zone, an estuary or a distance of 100 metres inland of the highwater mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing , dredging, excavation, removal or moving;~~ ~~a. Is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or~~ ~~b. Occurs behind the development setback line.~~ *The development of the facility may require the excavation, removal or moving of soil from a watercourse for underground cables to the substation.*
GN 544, 18 June 2010	22	The construction of a road, outside urban areas, ~~i. With a reserve wider than 13.5 metres or,~~ ii. Where no road reserve exists where the road is wider than 8 metres, or ~~iii. For which an environmental authorisation was obtained for the route determination in terms of activity 5 of Government Notice 387 of 2006 or activity 18 of Notice 545 of 2010.~~ *Construction of a road wider than 8 m outside an urban area may be required.*
GN545, 18 June 2010	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more. *The PV facility will have a generation capacity of up to 75MW.*
GN545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for

		residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; Except where such physical alteration takes place for: *(i)* Linear development activities. *(ii)* Agriculture or afforestation where activity 16 in this schedule will apply. *The PV facility will occupy an area greater than 20 hectares for commercial electricity generation which will be sold to Eskom.*
GN 546, 18 June 2010	13(c)ii	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. *An area of 1 ha or more of indigenous vegetation cover may need to be cleared. The relevance of this activity will be determined in the EIA process.*
GN 546, 18 June 2010	16(iii)& (iv)	The construction of: i. Buildings with a footprint exceeding 10 square metres in size or ii. Infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. *Buildings larger than 10 m^2 or 10 m^2 within 32 m of a watercourse may be required to be built.*

Therefore, a Scoping and an EIA Phase are required to be undertaken for the proposed project. This process is to be undertaken in two phases as follows:

» The **Scoping Phase** includes the **identification** of potential issues associated with the proposed project through a **desktop study** and consultation with affected parties and key stakeholders. Areas of sensitivity within the broader site are identified and delineated in order to identify any environmental fatal flaws, and sensitive or no go areas. Following a public review period of the draft report, this phase culminates in the submission of a Final Scoping Report and Plan of Study for EIA to the DEA.

» The **EIA Phase** involves a detailed **assessment** of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase includes detailed specialist investigations and public consultation. Following a public review period of the draft report, this phase culminates in the submission of a Final EIA Report and a draft **Environmental Management Programme** (EMP), including recommendations of practical and achievable mitigation and management measures, to DEA for review and decision-making.

This Draft Scoping Report documents the evaluation of the potential environmental impacts of the proposed solar facility and forms part of the EIA process. The Scoping Phase was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

1.4. The Environmental Assessment Practitioners

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

Savannah Environmental is a specialist environmental consulting company providing holistic environmental management services, including environmental impact assessments and planning to ensure compliance and evaluate the risk of development; and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in environmental impact assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

» Karen Jodas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 15 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.

» Ravisha Ajodhapersadh holds an Honours Bachelor of Science degree in Environmental Management and has 4 years' experience in environmental management and has undertaken EIAs for other proposed solar energy facilities in South Africa.

» Umeshree Naicker - Holds an Honours Bachelor of Science degree in Environmental Science and has 4 years' experience in environmental management.

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

» Ecology – Dr. Helga van der Merwe
» Geology, soils, and erosion and agricultural potential – Dr L G du Pisani
» Heritage and Paleaological Assessment– Zone Land Solutions (Pty) Ltd
» Visual – Zone Land Solutions (Pty) Ltd
» Social – Tony Barbour Environmental Consultancy

Refer to Appendix A for the curricula vitae for Savannah Environmental and the specialist sub-consultants.

SCOPE OF THE PROPOSED PROJECT CHAPTER 2

The following chapter provides an overview of the proposed Klip Gat Solar Energy Facility (75MW) and details the project scope which includes the planning/design, construction, operation and decommissioning activities. This chapter also explores site-specific and technology alternatives as well as the "do nothing" option.

The PV solar energy facility and associated infrastructure is proposed to be located on Portion 2 of Farm Klip Gat 80. The larger farm portion covers an area of approximately 848 hectares, which is much larger than the development footprint for the facility (which has not been finalised as yet). The facility can therefore be appropriately placed within the boundary of the larger site taking any identified environmental and other constraints into account.

The facility is proposed to accommodate an installed electricity generation capacity up to 75 MW and will include the following infrastructure and/ activities:

» An array of photovoltaic (PV) panels.
» A new on-site substation to evacuate the power from the facility into the Eskom grid via the existing Linde/Carolus 132kV power line which traverses the site.
» The substation is proposed to be connected via a loop-in loop-out connection to the existing 132kV power line or there will be an upgrade or construction of a new power line.
» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling between the project components, to be lain underground where practical.
» Internal access roads and fencing.
» Workshop area for maintenance, storage, and offices.

2.1. Project Alternatives

In accordance with the requirements of the EIA Regulations, project alternatives have been considered within the EIA process. These are detailed below.

Site Extent

Approximately 115 ha would be required for a facility of up to 75MW. The proposed site which is approximately 848 ha in extent will therefore be sufficient for the installation of the proposed facility, and will allow sufficient space for the avoidance of any identified environmental constraints within the final design of the facility.

Site access

The site can be accessed easily via existing access roads from the N1 and other secondary and gravel roads. There are also gravel roads within the site for ease of access.

Climatic Conditions

The economic viability of a photovoltaic plant is directly dependent on the annual direct solar irradiation values. A study of available radiation data shows that the proposed site is uniformly irradiated by the sun. In addition, compared to other areas in the country with similar irradiation, the site experiences moderate temperatures which are suitable for PV technology.

Gradient

A level surface area (i.e. with a minimal gradient in the region of 1%) is preferred for the installation of PV panels and specifically for PV technologies (Fluri, 2009). This reduces the need for extensive earthworks associated with the levelling of a site, thereby minimising environmental impacts. The proposed area for the proposed PV plant is located flat terrain.

Grid Connection

The substation is proposed to be connected via a loop-in loop-out connection to the existing Linde/Carolus 132kV power line power line or there will be an upgrade or construction of a new power line. More details of the grid connection will be provided in the EIA report, and will be based discussion with Eskom.

Based on these considerations, Klip Gat Solar Energy (Pty) Ltd considers the proposed site as a highly preferred site for the development of a PV Solar Energy Facility.

2.1. Layout Design Alternatives

As indicated above, the proposed facility is expected to have a developmental footprint which is smaller than the identified site. Therefore the facility and associated infrastructure (i.e. PV panels, internal roads, etc.) can be appropriately located in terms of avoidance of sensitive areas within the broader site. Therefore the extent of the site allows for the identification of layout design and site-specific alternatives.

The Scoping Phase aims to identify potentially environmentally sensitive areas on the site which should be avoided by the proposed development as far as possible. These areas will need to be considered in greater detail during the EIA Phase through site-specific specialist studies. The information from these studies will be used to inform layout alternatives for the proposed development site and inform recommendations regarding a preferred alternative. Specific design alternatives will include *inter alia* the layout of the PV panels, and alternative routes for the power line corridor and the access

roads. The aim of this planning process is to avoid environmentally sensitive areas as far as possible and inform the final design of the facility.

2.2. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Klipgat Solar Energy Facility. Should this alternative be selected then there will be impacts at a local and a broader scale. From a local perspective, the identified site, which is zoned for agricultural purposes, would not be impacted on from an environmental perspective, and could be utilised for future agricultural activities. However, at a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the facility is only proposed to contribute 75 MW to the grid capacity, this would assist in meeting the growing electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy.

The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. 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 short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive transmission and distribution losses.

Resource saving

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 per annum. This translates into revenue savings of R26.6 million per annum, as fuel for renewable energy facilities is free while compared to the continual purchase of fuel for conventional power stations. 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 in South Africa.

Pollution reduction

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

Climate friendly development

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

Support for international agreements

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

Employment creation

Although the immediate opportunity for job creation is limited due to a lack of local skilled, the sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation in South Africa in the long-term.

Acceptability to society

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

Support to a new industry sector

The development of renewable energy offers the opportunity to establish a new industry within the South African economy.

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. This is the basis of sustainable development.

2.3. Photovoltaic (PV) Solar Energy Facility and the Generation of Electricity

Solar energy facilities, such as those using PV panels, use the energy from the sun to generate electricity through a process known as the **Photovoltaic Effect**. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity.

A photovoltaic (PV) cell is made of silicone which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel. The PV cell is positively charged on one side and negatively charged on the other side and electrical conductors are attached to either side to form a circuit. This circuit then captures the released electrons in the form of an electric current (direct current). An inverter must be used to change the direct current (DC) it to alternating current (AC). The electricity is then transmitted through a power line for distribution and use.

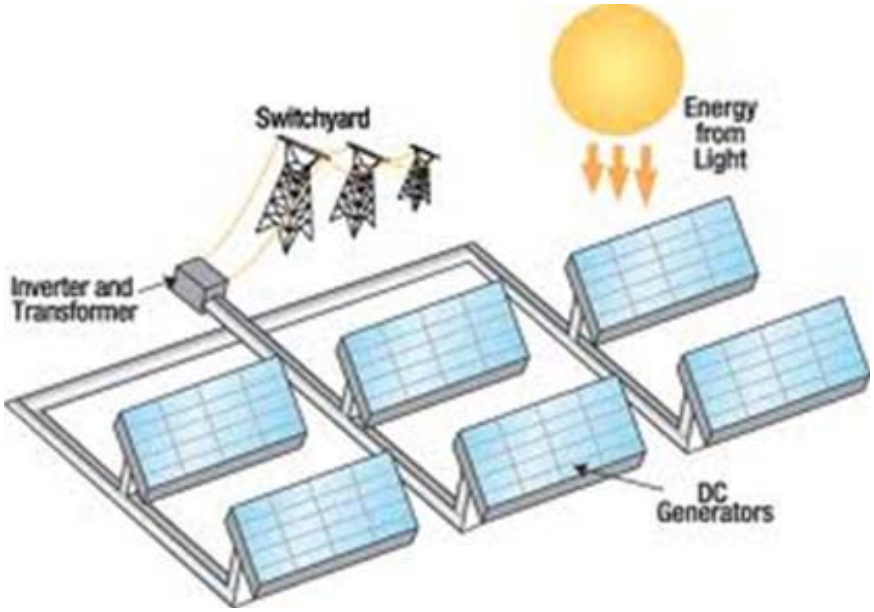

Figure 2.2: Schematic diagram of a PV plant (Sourced from: http://www.solar-green-wind.com/archives/tag/solar-cells)

The PV panels will be fixed to a support structure (as illustrated in Figure 2.3) set at an angle so to receive the maximum amount of solar radiation.

The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The Photovoltaic Effect is achieved through the use of the following components:

Photovoltaic Cells

An individual photovoltaic cell is made of silicone which acts as a semiconductor). The cell absorbs solar radiation which energises the electrons inside the cells and produces electricity. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel. A single cell is sufficient to power a small device such as an emergency telephone. However, to produce 75 MW of power, the proposed facility will require numerous cells arranged in multiples/arrays which will be fixed to a support structure.

The adopted mounting structure proposed for this project is a mono axial tracking frame with:

» Direction of rotation axis North – South
» Sun path direction tracking East – West
» Maximum allowed tracking angle, from +45° to -45°
» Maximum modules surface for frame, about 36 m^2

The height of the PV arrays is expected to be up to 2 m. This technology ensures, in term of energy production, an advantage of about 25% compared to the horizontal fixed one.

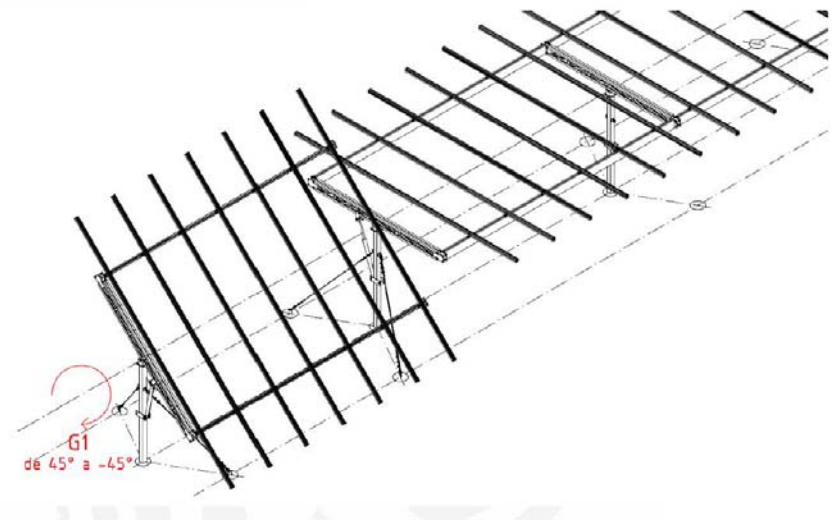

Figure 2.4: Frame, structural details of a tracking PV technology

2.4. Overview of the Construction Phase

In order to construct the proposed PV solar energy facility and associated infrastructure, a series of activities will need to be undertaken. The construction process is discussed in more detail below.

2.6.1 Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to, a geotechnical survey, a site survey and, survey of substation site and road servitudes.

2.6.2 Establishment of Access Roads to the Site

Access to the site (from the N1 and secondary roads) will be required. Within the site itself, access will be required to the individual facility components for construction purposes (and later limited access for maintenance). Upgrade of access roads within the site will be required and new access roads will be required. Access track construction would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The strength and durability properties of the rock strata at the proposed site are not known at this stage; this will need to be assessed via a geotechnical study to be conducted by the project proponent. Depending on the results of these studies, it may be possible, in some areas, to strip off the existing vegetation and ground surface and level the exposed formation to form an access track surface. The final layout of the access roads will be determined following the identification of site related sensitivities.

2.6.3 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.

2.6.4 Transport of Components and Equipment to Site

The components and equipment required for the construction of the proposed facility will be brought to site in sections by means of national and provincial roads and then proposed internal access road. Some of the components (i.e. transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[1] by virtue of the dimensional limitations (i.e. weight).
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 upgrade of the substation and site preparation.

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

2.6.5 Establishment of Laydown Areas on Site

Laydown and storage areas will be required for the typical construction equipment which will be required on site.

2.6.6 Erect PV Cells and Construct Substation & Invertors

The PV cells will be arranged in arrays. The frames will be fixed onto the ground with the use of concrete, depending on the soil conditions at the site. This will make the installation of the plant less invasive for the territory and facilitate the decommissioning at the end of its production cycle. The height of the PV panel structure will be up to 2 m.

Figure 2.5: Frame, structural details (Courtesy of Igeam, 2011)

The following figure shows how the structure is mounted on site.

Figure 2.6 Mounting of the frame for the PV panels (Courtesy of Igeam, 2011)

Inverters will be installed to facilitate the connection between the solar energy facility and the Eskom electricity grid via the Linde/Carolus 132kV power line. The position of

the inverters within the footprint of the broader site will be informed by the final positioning of the PV components.

The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

2.6.7 Establishment of Ancillary Infrastructure

Ancillary infrastructure will include a short turn-in overhead 132kV power line feeding into the Eskom electricity network via an existing power line located on the site, workshop, storage areas as well as 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.

2.6.9 Undertake Site Remediation

Once construction is completed and once all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and rehabilitated.

2.6. Operation Phase

The electricity that is generated from the PV panels will be stepped up through the on-site inverters and transformers at the substation. Thereafter the power will be evacuated from the on-site substation to the Eskom existing overhead power line to feed into the grid via the Linde/Carolus 132kV power line which traverse the site.

It is anticipated that a full-time security, maintenance and control room staff will be required on site. Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities.

2.7. Decommissioning Phase

The solar energy facility is expected to have a lifespan of more than 20 years (with maintenance) and the power plant infrastructure would only be decommissioned once it has reached the end of its economic life. If economically feasible/desirable the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/ infrastructure available at that time. However, if not deemed so, then the facility would be completely decommissioned which would include the following decommissioning activities.

2.7.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas) and the mobilisation of decommissioning equipment.

2.7.2. Disassemble and Replace Existing Components

The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 3

An Environmental Impact Assessment (EIA) process refers to that process (dictated by the EIA Regulations) which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project. The EIA process comprises two main phases: i.e. **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an environmental management programme (EMP)) to the competent authority for decision-making. The EIA process is illustrated below:

Figure 3.1: The Phases of an EIA Process

The Scoping Phase for the proposed Klipgat Solar Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010 as amended, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). In accordance with these Regulations, this scoping process aimed at identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving desk-top specialist studies , as well as a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). This chapter serves to outline the process which was followed during the Scoping Phase of the EIA process.

3.1. Objectives of the Scoping Phase

This Scoping Phase aimed to:

» Identify and evaluate potential environmental (biophysical and social) impacts and benefits of all phases of the proposed development (including design, construction, operation and decommissioning) within the broader study area through a desk-top review of existing baseline data and specialist studies.
» Identify potentially sensitive environmental features and areas on the site to inform the preliminary design process of the facility.
» Define the scope of studies to be undertaken within the EIA process.

» Provide the authorities with sufficient information in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required to be undertaken as part of the EIA Phase of the process.

Within this context, the objectives of this Scoping Phase are to:

» Clarify the scope and nature of the proposed activities.
» Clarify the reasonable and feasible project-specific alternatives to be considered through the EIA process, including the "do nothing" option.
» Identify and evaluate key environmental issues/impacts associated with the proposed project, and through a process of broad-based consultation with stakeholders and desk-top specialist studies, identify those issues to be addressed in more detail in the Impact Assessment Phase of the EIA process, as well as potentially sensitive environmental features and areas which should be considered in the preliminary design phase.
» Conduct an open, participatory, and transparent public involvement process and facilitate the inclusion of stakeholders' concerns regarding the proposed project into the decision-making process.

3.2. Overview of the Scoping Phase

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010 as amendeed, in terms of NEMA. Key tasks undertaken within the scoping phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of a completed application form for authorisation in terms of Regulation 12 and 26 of Government Notice No R543 of 2010 to the competent authority (DEA).
» Undertaking a public involvement process throughout the Scoping process in accordance with Chapter 6 of Government Notice No R543 of 2010 in order to identify issues and concerns associated with the proposed project.
» Preparation of an Issues and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of Government Notice No R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of Government Notice No R543 of 2010.
» Preparation of a Draft Scoping Report and Plan of Study for EIA in accordance with the requirements of the Regulation 28 Government Notice No R543 of 2010.

The tasks are discussed in detail below.

3.2.1. Authority Consultation and Application for Authorisation in terms of GNR543 of 2010

As this is an **energy generation** project the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Northern Cape Department of Environmental and Nature Conservation (DENC) acts as a commenting authority for the project. Consultation with these authorities has been undertaken throughout the Scoping process. This consultation has included the following:

» Submission of an application for authorisation to DEA, with a copy submitted to NC DENC. Authorisation to continue with the Scoping Phase of the project was granted as this application was accepted by DEA under the reference number 14/12/16/3/3/2/354 allocated to the project by DEA.

A record of all authority consultation undertaken prior to and within the Scoping Phase is included within Appendix B.

3.2.2. I&AP Identification, Registration and the Creation of an Electronic Database

The first step in the public involvement process was to identify relevant stakeholders and interested and affected parties (I&APs). This process was undertaken through existing contacts and databases, recording responses to site notices and newspaper advertisements, as well as through the process of networking. Stakeholder groups identified include:

» Provincial and local government departments (including DEA, NC DENC, SAHRA, Department of Water Affairs, Department of Agriculture and Land Reform; SANRAL, etc)
» Government Structures (including the Provincial Roads Authority, municipal planning departments, etc)
» Emthangeni Local Municipality and Pixley ka Seme District Municipality
» Potentially affected and neighbouring landowners and tenants
» Conservation authorities
» Industry and business; and
» CBOs and other NGOs

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C for a listing of recorded parties). While I&APs have been encouraged to register their interest in the project from the start of the process, the identification and registration of I&APs will be on-going for the duration of the EIA process. The project database will be updated on an on-going basis throughout the

project process, and will act as a record of the parties involved in the public involvement process.

3.2.3. Notification of the EIA Process

In order to notify and inform the public of the proposed project and invite members of the public to register as interested and affected parties (I&APs), the project, and EIA process was advertised in the following newspapers:

» The Volksblad (27 July 2012)
» De Aar Echo (23 July 2012)

Site advertisements were placed on the site (fence and/boundaries) and in public places in accordance with the requirements of the EIA Regulations.

In addition to the above advertisements and notices, key stakeholders and registered I&APs were notified in writing of the commencement of the EIA process. These parties included, inter alia:

» Relevant parties from Municipalities potentially affected (directly or indirectly) by the proposed project
» Communities and potentially affected landowners
» Organ of state having jurisdiction in respect of any aspect of the activity, including:
  * Northern Cape Department of Environmental and Nature Conservation (DENC)
  * Northern Cape - Agriculture and Rural Development
  * Northern Cape - Public Works, Roads and Transport
  * Northern Cape - Water Affairs
  * South African Heritage Resources Agency
  * SANRAL
  * Emthangeni Local Municipality
  * Pixley ka Seme District Municipality
  * Eskom
  * Department of Energy
  * National Department of Agriculture, Forestry and Fisheries

Copies of all the advertisements placed and notices distributed are contained in Appendix D of this report.

3.2.4. Public Involvement and Consultation

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

» All potential stakeholders and I&APs are identified and consulted with;

» Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs;
» Participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the application; and
» Comment received from stakeholders and I&APs is recorded.

In order to provide information regarding the proposed project and the EIA process, a background information document (BID) for the project was compiled at the outset of the process (refer to Appendix E). The BID was distributed to identified stakeholders and I&APs, and additional copies were made available at public venues within the broader study area.

Through consultation with key stakeholders and I&APs, issues for inclusion within the issues-based scoping study were identified and confirmed. In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their views, issues and concerns regarding the project, various opportunities have been and will continue to be provided for I&APs to have their issues noted after the release of the Draft Scoping Report for public review, as follows:

» **Public meeting** in the study area (open meeting advertised in the local press)
» **Focus group meetings** (pre-arranged and stakeholders invited to attend)
» One-on-one **consultation meetings** (for example with directly affected or surrounding landowners)
» **Telephonic** consultation sessions
» Written, faxed or e-mail **correspondence**

Networking with I&APs will continue throughout the duration of the EIA process.

3.2.5. Identification and Recording of Issues and Concerns

All comments received from stakeholders and I&APs on the proposed project will be included in the Final Scoping Report. A Comments and Response Report will be compiled to include all comments received during the scoping phase of the process, including those received in the public review period of the draft Scoping Report.

3.2.6. Evaluation of Issues Identified through the Scoping Process

Issues (both direct and indirect environmental impacts) associated with the proposed project identified within the scoping process have been evaluated through desk-top studies. In evaluating potential impacts, Savannah Environmental has been assisted by the following specialist consultants:

Specialist	Area of Expertise	Refer Appendix
Dr. Helga van der Merwe	Ecology	Appendix F
Dr L G du Pisani	Soils and Agricultural potential	Appendix G
Zone Land Solutions (Pty) Ltd	Visual	Appendix H
Zone Land Solutions (Pty) Ltd	Heritage & Palaeontology	Appendix I
Tony Barbour Environmental Consultancy	Social	Appendix J

In order to evaluate issues and assign an order of priority, it was necessary to identify the characteristics of each potential issue/impact:

» *the nature,* which includes 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) or regional

The evaluation of the issues resulted in a statement regarding the potential significance of the identified issues, as well as recommendations regarding further studies required within an EIA.

Specialist Scoping Reports are contained within Appendices F – J.

3.2.7. Public Review of Draft Scoping Report and Feedback Meeting

This is the **current stage** of the Scoping Phase. The Draft Scoping Report has been made available for public review from **8 August 2012 – 8 September** at the following locations:

» Noupoort Public Library
» Hanover Public Library
» www.savannahSA.com

In order to facilitate comments on the Draft Scoping Report, a public meeting will be held during the review period for the Draft Scoping Report as follows:

» Date: 23 August 2012 (Thursday)
» Time: 16h30
» Venue: Hutcheson Hall in Noupoort

The public review process and details of the public meeting were advertised in regional and local newspapers. In addition, all registered I&APs were notified of the availability of the report and public meeting by letter (refer to Appendix E).

3.2.8. Final Scoping Report

The final stage in the Scoping Phase will entail the capturing of responses from stakeholders and I&APs on the Draft Scoping Report in order to refine this report. It is this final report upon which the decision-making environmental Authorities provide comment, recommendations, and acceptance to undertake the EIA Phase of the process.

3.3 Regulatory and Legal Context

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As solar energy development is a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process for solar energy facility project and the related statutory environmental assessment process.

3.3.1. Regulatory Hierarchy

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

» *Department of Energy:* This department is responsible for policy relating to all energy forms, including renewable energy. Solar energy is considered under the White Paper for Renewable Energy and the Department undertakes research in this regard. This department is the controlling authority in terms of the Electricity Act (Act No 41 of 1987).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for solar energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
» *South African National Roads Agency Limited (SANRAL):* This department is responsible for all National road routes.

At **Provincial Level**, the main regulatory agency is:

» Northern Cape Department of Environmental and Nature Conservation (DENC). This department is the commenting authority for this project.

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment. i.e. the Emthangeni Local Municipalityand the Pixley ka Seme District Municipality.

» The Emthangeni Local Municipalityis located within the Pixley ka Seme 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.
» Spatial Development Frameworks (such as the Pixley ka Seme District Municipality SDF).
» By-laws and policies have been formulated by local authorities to protect visual and aesthetic resources relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc.

There are also numerous non-statutory bodies such as Solar Energy Associations and environmental lobby groups that play a role in various aspects of planning and the environment that will influence solar energy development.

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

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

- National Environmental Management Act (Act No 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010) as amended
- 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)

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the scoping report, and to be addressed in the EIA. A listing of relevant legislation is provided in Table 3.1. A more detailed review of legislative requirements applicable to the proposed project will be included in the EIA phase.

Table 3.1: Initial review of relevant policies, legislation, guidelines, and standards applicable to the proposed Klipgat Solar Energy Facility EIA

Legislation	Applicable Sections
	National Legislation
Constitution of the Republic of South Africa (Act No 108 of 1996)	» Bill of Rights (S2) » Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being » Rights to freedom of movement and residence (S22) » Property rights (S25) » Access to information (S32) » Right to just administrative action (S33)
National Environmental Management Act (Act No 107 of 1998)	» National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment » NEMA EIA Regulations (GN R385, 386 & 387 of 21 April 2006) (published in terms of Chapter 5), with effect from 3 July 2006

Legislation	Applicable Sections
	» The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations) » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise & rectify pollution or degradation of the environment » Procedures to be followed in the event of an emergency incident which may impact on the environment (S30)
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7) » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35) » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36) » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development (S38) » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44)
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to list ecosystems which are threatened and in need of protection (S52) – none have as yet been published » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) - none have as yet been published » A list of threatened & protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » This act also regulates alien and invader species. » Under this Act, a permit would be required for any

Legislation	Applicable Sections
	activity which is of a nature that may negatively impact on the survival of a listed protected species.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» Measures in respect of dust control (S32) – no regulations promulgated as yet » Measures to control noise (S34) - no regulations promulgated as yet
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048)
National Water Act (Act No 36 of 1998)	» National Government is the public trustee of the Nation's water resources (S3) » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1. General Authorisation Government Gazette No. 20526 8 October 1999 is of relevance. » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) » Definition of water use and requirement for water use licenses for certain activities (S21) » Requirements for registration of water use (S26 and S34) » Definition of offences in terms of the Act (S151)
National Environmental Management: Waste Act (Act No 59 of 2008)	» The purpose of this Act is to reform the law regulating waste management in order to protect health and the environment by providing for the licensing and control of waste management activities. » The Act provides flisted activities requiring a waste license
National Forests Act (Act No 84 of 1998)	» Protected trees: According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. » Forests: The Act prohibits the destruction of indigenous

Legislation	Applicable Sections
	trees in any natural forest without a licence.
Guideline Documents	
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits
Policies and White Papers	
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed solar energy facility, is supported by this white Paper.
The White Paper on Renewable Energy (November 2003)	» This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

DESCRIPTION OF THE RECIEVING ENVIRONMENT CHAPTER 4

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

4.1 Regional Setting: Location of the Study Area

The project site is located in the Emthanjeni Local Municipality (NC073) in the Northern Cape Province. The site is located ~20km north-west of the town of Noupoort. Hanover is the other town in the region. As illustrated by the figure below, the subject property is not located near any transportation routes. The major transportation routes in the area are the N1, N9 and N10. All of these roads are situated between 17km and 20km from the project site. The R389 runs between Hanover in the east and Noupoort in the west. This road is ~8km to the south of the project site. In addition, a railway line crosses ~2.5km north-east of the project site en route to De Aar.

An Eskompower line (the Linde/Carolus 1 132 kV power line) crosses the site in a south-east-to north-west direction. The electricity generated from the Klip Gat facility is planned to be evacuated into the electrical grid via the existing Linde/Carolus 1 132 kV power line

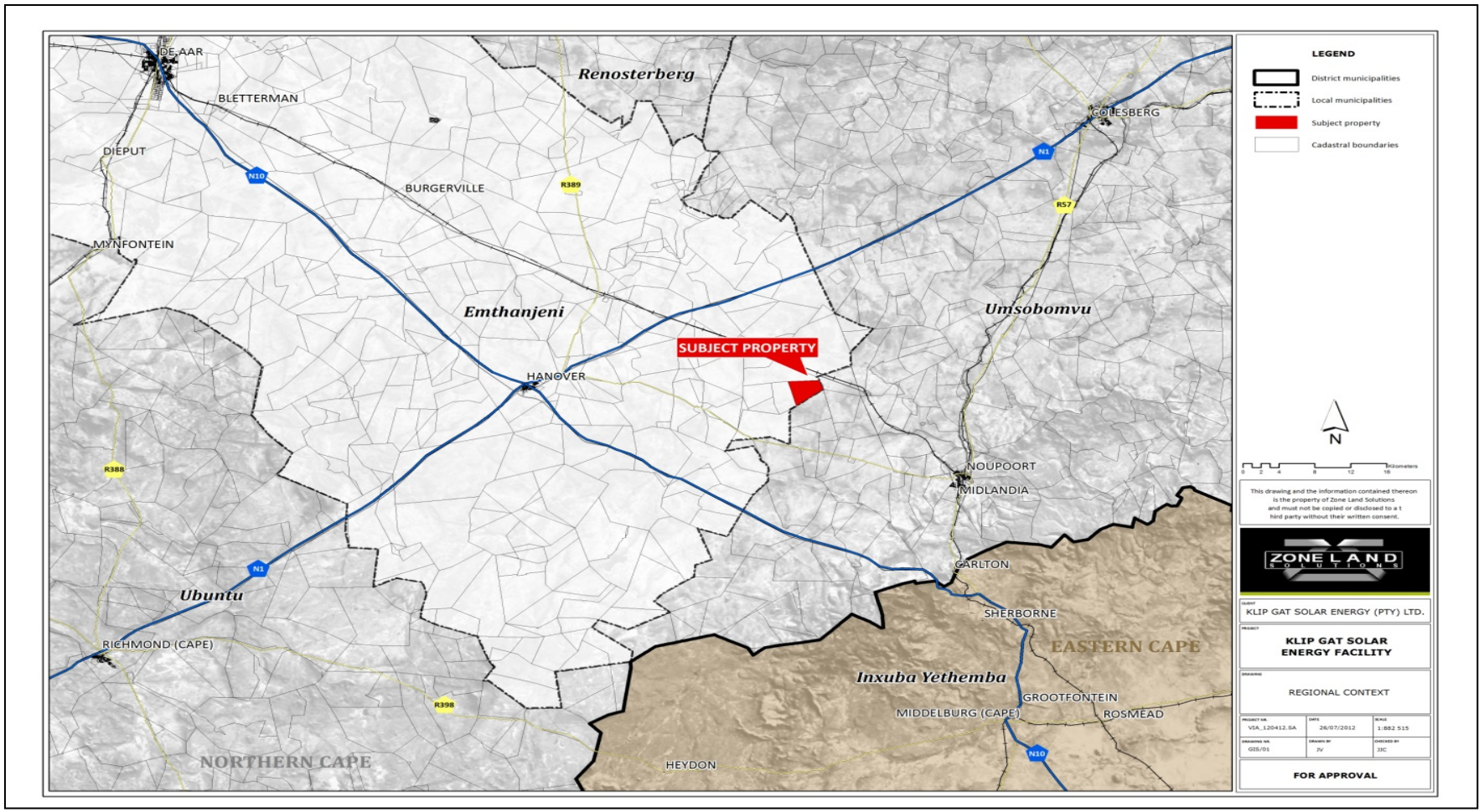

Figure 4.1: Regional context of the project site

4.2 Climatic Conditions

The climate of the Northern Cape region is categorized as semi-arid. Rainfall is largely due to showers and thunderstorms, falling mainly in the months between October to March, with the peak of the rainy season between January and April. The longterm average annual rainfall for the area is 290mm. Violent thunderstorms with high rainfall intensities are common.

The low mean annual rainfall puts the site in a semi-arid category where dry land cropping is not recommended, accept on land with deep soils (deeper than 1000mm) and with a relatively high water table.

The mean maximum temperature recorded at the Grootfontein Agricultural Station is for January (30.4°C) duringthe warmest month, and a mean minimum temperature for July (0.1°C) was recorded for the coldest month. An extreme maximum of 38.8°C (recorded in January) and an extreme minimum of -10.3°C (recorded in July) has been recorded at thisthe station.

4.3. Access and Transport Routes in the region

The site is accessible from the N1 national road between Coleburg and Hanover via gravel roads The N10 from Port Elizabeth is the main national route inland to Bloemfontein.

4.4. Biophysical Characteristics of the Study Area

4.3.1 Topography

The site (Portion 2 of Farm 80)is situated has a gently undulating topography (Figure 4.2). Further north and south of the property, hills and low mountains are evident. No drainage lines are indicated on the topo-cadastral map. .

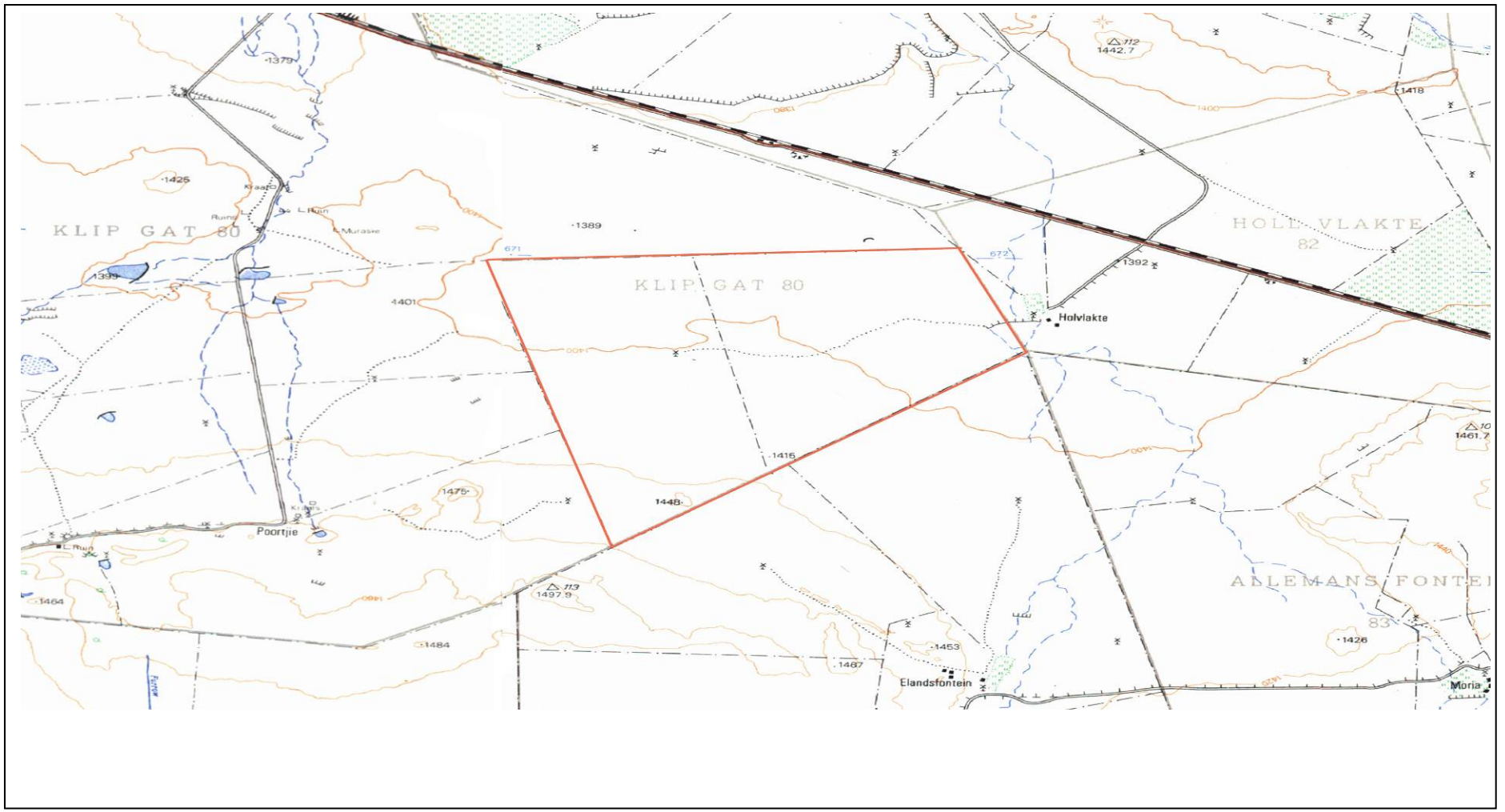

Figure 4.2: A map indicating the general topography of the proposed Klip Gat Solar Energy Facility sites and surrounding environment

4.3.2 Geology

According to the Land Type Survey Staff (1987) and Johnson et. al. (2006) the site's geology can be categorized as shale, mudstone & sandstone of the Adelaide Subgroup of the Beaufort Group, Karoo Sequence, with dolerite intrusions common. The site is situated within land types Da14 (85% of the site area), Da6 (5% of the site area), Da34 (5% of the site area) and Ib206 (5% of the site area). The Da land types consist of soils with either prismacutanic and/or pedocutanic diagnostic horizons, with a red colour in the B-horizon.

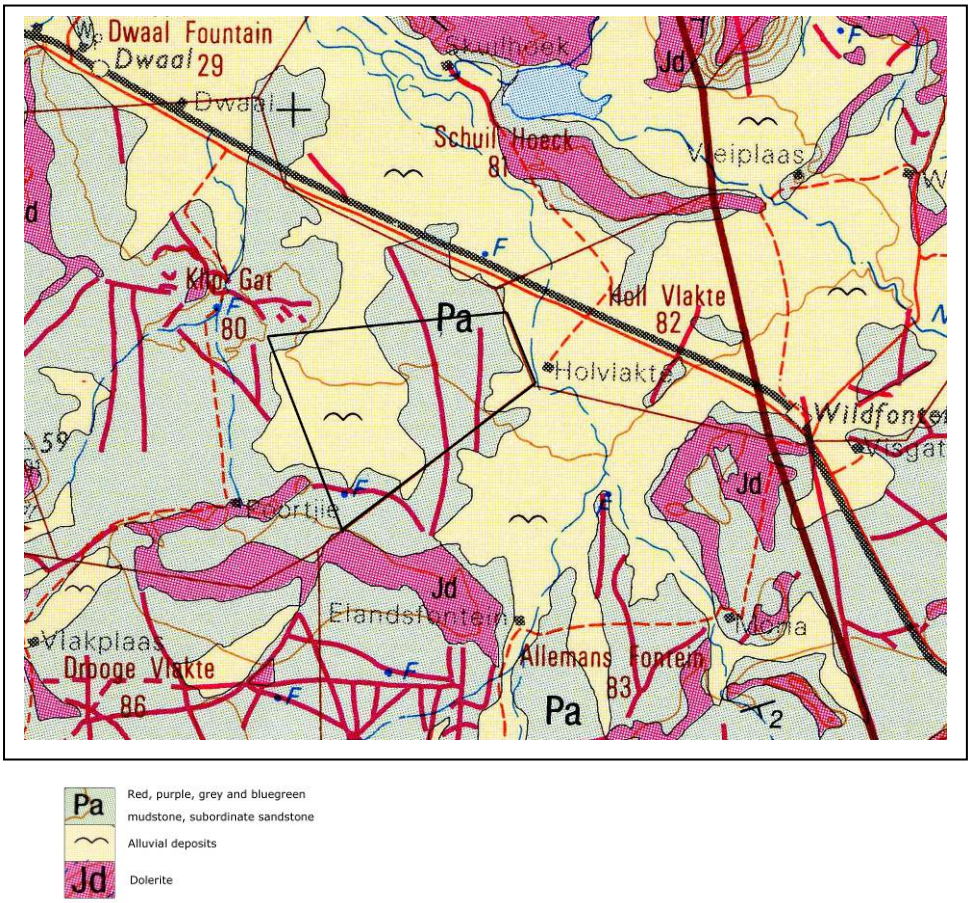

Figure 4.3: Geology of the proposed Klip Gat Solar Energy Facility in relation to the surrounding environment.

4.3.3 Soil Types

The soils are generally shallow and the effective depth varies between 30mm and 1200mm. The clay content varies between 15% and 30% in the A-horizon, and between 10% and 45% in the B21-horizon. Considering the soil types and soil

depths occurring in the area puts the site in a category of "not suitable for cultivation".

The susceptibility of the soils to wind erosion is categorised as somewhat susceptible, while the susceptibility to water erosion is categorised as low to moderate and the soil loss potential is categorised as moderate.

4.3.4 Agricultural Potential

There are no cultivated lands visible on either the topographic maps or Google Earth Images of the site. The absence of cultivated lands should be verified during the full EIA process to ensure that no development takes place within them. There are no agricultural important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.) that will be interfered with, visible on the topographic maps or Google Earth Images.

The grazing capacity of the region varies between 18 ha/LSU and 25 ha/LSU. The site is situated in a Relative Homogenous Farming Area with an area of 208 350ha. The area of the site (848ha) represents less than 0,5% of this area, while the carrying capacity is at best 53 large stock units, making the site insignificant in terms of agricultural production and food security. This region is categorized as non-arable with low to moderate potential grazing land. The "best use" for the area is for grazing with sheep, goats and beef cattle.

4.3.5 Hydrology

No drainage lines are indicated on the topocadastral map However, a stratification of satellite images indicates areas that could potentially be seasonal washes and this will have to be investigated further during the field survey.

4.5. Land use and Land capability of the Study Area

The site falls within Veld Type 36 (False Upper Karoo) (Acocks, 1988) and Biome NKu4 (Eastern Upper Karoo) (Mucina & Rutherford, 2006). This biome occurs on flats and gently sloping plains, interspersed with hills and rocky areas between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north and Burgersdorp, Hofmeyr and Cradock in the east, with the great escarpment in the south. This veld type constitutes the most spectacular of all the changes in the vegetation of South Africa . This former primarily grass veld changed to a

mixture of grasses and karoo shrubs and is dominated by dwarf microphyllous shrubs, with white grasses of the genera Aristida and Eragrostis.

4.6. Ecological Profile

4.6.1. Vegetation

The site falls within Veld Type 36 (False Upper Karoo) (Acocks, 1988) and Biome NKu4 (Eastern Upper Karoo) (Mucina & Rutherford, 2006). This biome occurs on flats and gently sloping plains, interspersed with hills and rocky areas between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north and Burgersdorp, Hofmeyr and Cradock in the east, with the great escarpment in the south. This veld type constitutes the most spectacular of all the changes in the vegetation of South Africa (Acocks, 1988). This former primarily grass veld changed to a mixture of grasses and karoo shrubs and is dominated by dwarf microphyllous shrubs, with white grasses of the genera Aristida and Eragrostis.

A very small area of Tarkastad Montane Shrubland (Gs17) occurs on the eastern boundary of the Naauw Poort property. Ridges, hills and isolated mountain slopes characterise this vegetation type. These areas are covered with low, semi-open, mixed shrubland and prominent species include: *Diospyros austro-africana, Euryops annae, Aristida* spp*., Cynodon incompletus* and *Eragrostis* spp. This vegetation type covers an area of 4240 km^2. The Tarkastad Montane Shrubland is regarded as Least Threatened with about 1-2% being statutorily conserved and about 2% transformed by cultivation or the building of dams.

Figure 4.4: Existing vegetation on the proposed Klip Gat Solar Energy Facility sites and surrounding environment

4.6.2. Red List Animal Species

The SIBIS:SABIF Integrating Biodiversity Information website was used to generate lists of fauna that could potentially occur on the proposed Klip Gat site (Appendix B). These data are generated for a quarter degree grid (3124BA and 3124BB). Species on the generated lists would not necessarily be found on site, since the habitat on site would not necessarily be suitable for all these species.

» Mammals:
  - Black-footed cat - Vulnerable
  - African wild cat - Not Assessed
  - White-tailed mouse Endangered
  - Leopard - Near Threatened
  - Aardwolf - Least Concern

» Birds
  - Blue crane - Vulnerable
  - Verreaux's eagle - Least Concern
  - Black stork - Least Concern
  - Black harrier - Vulnerable
  - Blue bustard - Near Threatened
  - Lesser kestrel - Least Concern
  - Rock kestrel - Least Concern
  - Greater kestrel - Least Concern
  - Ludwig's bustard Near Threatened
  - martial eagle Near Threatened

4.6.2. Water Bodies

No drainage lines are indicated on the topocadastral map however, a stratification of satellite images indicates areas that could potentially be seasonal washes and this will have to be investigated further during the field survey.

4.7 Social Characteristics of the Study Area and Surrounds

4.7.1 Population

Despite having the largest surface area, the Northern Cape has the smallest population of 822 727 (Census 2001) or 1.8% of the population of South Africa. The population has declined by 2.1% from 1996 (840 321) to 2001 (822 727), resulting in a decrease in the population density, of an already sparsely populated province, from 2.32 to 2.27 persons per km^2. Of the five districts, Frances Baard has the largest population of 303 239. The other districts and their respective populations are Siyanda (209 889), Pixley ka Seme (164 607), John Taolo Gaetsewe DM (36 881) and Namakwa (108 111). The population can be classified

as a young population with 57.7% of the population being younger than 30 years old. The female proportion makes up approximately 51.2% of the total with males making up the remaining 48.8%. The 2001 Census data indicates a significant shift in the 20 – 24 cohort occurs, which can possibly be attributed to, amongst others, people in this age group moving to other provinces in search of better career and job opportunities and tertiary education. Research indicates that approximately 36% of the migrants from the Northern Cape moved to the Western Cape, while 19.4% moved to the North West (19.4%), 18.5% to Gauteng and 12.8% to the Free State (12.8%). In addition, there has also been an increase in migration from the rural areas to the larger towns in the province over the last five years. This movement is in response to the improved access to opportunities and services within the larger urban centers. This trend is reflected in the increase in the proportion of people living in urban areas from 75.2% in 1996 to 82.7% in 2001

4.7.2 Age Structure

The age profile of the population reveals that approximately 65.2% of the population falls within the economically active age bracket of between 15-64 years of age. Approximately 30% of the population is 15 years old or less while the remaining 5% of the population are 64 years old or older. According to the Municipal IDP, 31% of the population falls within the school going age group of 7 to 19 years.

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4.7.3 Education levels

In general, there has been an improvement in the educational qualifications of the labour force in the Northern Cape. There has also been an increase in the proportion of the labour force that has a secondary and tertiary education. This would appear to be the result of an increase in access to education since 1994, in particular, amongst new entrants to the labour force.

4.7.4 Employment

Unemployment within the ELM is estimated at 23.1% of the total labour force, which is below the Northern Cape average of ~27% while 43.5% of the population is not economically active[2]. 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. The

[2] 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.

ELM IDP and supporting documents do not provide any detail regarding the relative size of the each of the economic sector's contribution to employment in the ELM.

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4.7.6 Economic context

In terms of economic importance, the Northern Cape's share of the country's 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%.

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%.

4.8 Heritage

4.8.1. Stone Age

The Stone Age archaeology of southern Africa is divided into three categories, namely: the Early Stone Age, Middle Stone Age and the Late Stone Age. These Stone Age industries are well documented throughout the southern Africa regions (i.e. in countries that form the political geography of SADC).

Early Stone Age

In the Northern Cape some of the earliest known Early Stone Age (ESA) industry is the Victoria West Stone Industry which also spreads to the Free State Province, but is dominant in the Northern Cape. The Victoria West Stone Industry was first recorded and defined by R. A., Smith in 1915 and in the Free State region it is found along the Vaal River basin. Tools found in this industry included hand axes and what Smith refers to as 'Tortoise Cores' (Smith, 1920). The "Tortoise Cores" are most probably Smith's reference to the peculiar feature or morphology of Prepared Cores – where different pieces are chipped off from a single piece of

parent material to make way for the ultimate removal or shaping of a specific tool and most likely a well-defined hand axe. A. H. J., Goodwin (1935) defines the Victoria West Industry as an industry that is with and without cores. Meaning that hand axes and cleavers could have been produced without necessarily having to prepare a parent material to a point to which a single definable tool could be produced. The absence of prepared cores in relation to hand axes and cleaver did not mean the end to this stone tool manufacturing techniques for it becomes a dominant and defining feature towards the end of the ESA into the MSA (Middle Stone Age). What first became known as 'Tortoise Cores' was later defined as the transition marker between the ESA and the MSA. Therefore, the Prepared Cored of the Victoria West industry can be taken as the markers of transitional period in the Stone Age industry from Acheulian into the MSA, a second clearly defined phase in Stone Age technological innovation. Lycett (2009) sees the Victoria West as an evolutionary step towards the Levallois Prepared Core Technique which signifies the outwards spread of the Stone Age technology.

Middle Stone Age

During the MSA smaller and sizeable stone artefacts replace the dominant large and often imposing hand axes and cleavers that characterise the ESA. This distinction or transition in archaeological records has been dated to 250 k.y.a. During this period, smaller artefacts define the archaeological records and the most dominant ones are flake and blade industry. As such, this technological period has been defined by some in 'archaeological circles' as a period that signifies a secondary step towards the modern human behaviour through technology, physical appearance, art and symbolism (e.g. Binneman et al. 2011). This innovation is suggested to have been at its most probable peak during the last 120 k.y.a. With surface scatters of the flake and blade industries found throughout the southern Africa regions (e.g. Thompson & Maream, 2008). They often occur between surface and approximately 50-80cm below ground. At times, in some sites, fossil bones are found in association with the MSA stone artefacts. The flakes and blade industries are often found in secondary context as surface scatters and occurrence like their predecessor industries. Malan (1949) defines the earliest MSA stone industry as the Mangosia and its distribution stretching across the Limpopo, the Griqualand in Northern Cape, Natal, and the Cape Point as well as the Free State Province. Griqualand is located some hundred of kilometres north of the current study area and presents one of the cultural and political geographic landscape forming part of the South African heritage puzzle (refer to Figure for historic Griqualand boundaries). The Prepared Core Technique which had become the defining technological technique of the MSA is in this industry replaced by the Micro Lithics that become a dominant feature or trait in the LSA (Late Stone Age). In the Northern Cape Province artefacts associated with the Mangosia industry are known to have been made from indurate shale raw material (Binneman et al. 2011). They mostly occur as surface scatter. The MSA tools include flakes, blades and points. Their

time sequence is often not known because they mostly occur in surface. Other industries within the MSA include:

» The Howieson's Poort which is known to have wide distribution throughout southern African including the Northern Cape Province.
» The Orangia 128 to 75 k.y.a.
» Florisbad and Zeekoegat industries dated between 64 and 32 k.y.a - Florisbad is dominant in the Free State Province but also found in the Northern Cape.

Late Stone Age

The southern Africa LSA is known to span a period from 30 k.y.a to the historical time i.e. the last 500 years to 100 years ago (e.g. Mitchell & Whitelaw, 2000). It is associated in archaeological records with the San hunter-gathers (ibid). This is particular important for the last 10 k.y.a whereby the San material culture dominate the archaeological records -mostly in rock shelters, caves as well as open air sites in both the interior and coastal regions (ibid). However, the San open air sites are not always easy to find because they are in most cases covered by the various forms and types of vegetation and the other contributing factor is the mobility nature of these people. They were not sedentary people like their Iron Age counter parts who needed to settle the land for ploughing and long term seasonal grazing periods etc. In the coastal regions, sand dunes sometimes become impediments in locating LSA sites. Owning to all these factors the preservation state of the LSA archaeology is often poor and not easily disenable (Deacon & Deacon 1999). Caves and rock shelters provide a more substantial preservation record of pre-colonial record of indigenous people's archaeology. This is in form of stone artefacts, rock art and other material culture such as beads etc. It has recently emerged that the LSA archaeology was not solely dominated by the San hunter-gathers particularly in the last half -in some 2 k.y.a the southern Africa landscape was penetrated by the Khoekhoe pastoralist introducing sheep, cattle and goal along with them (e.g. Hall & Smith, 2000; Sadr). Ceramic vessels are some of the material culture that signifies the Khoekhoe material culture in archaeological records – including the depiction of sheep and cattle often found in San hunter-gather rock art (ibid). Smith and Hall (2000) give detailed descriptions of potential relations that could have taken place between the San, the Khoekhoe and the Iron Age farmers. They also argue that the material culture of the Khoekhoe herders included among other things the art of making rock art. Binneman (et al. 2011) suggests that the diet of this new group of people would have also included muscle collected along the muddy river banks, coastal line and riverine and terrestrial foods. Other than the material culture such as artefacts found within the LSA industries, burials or human remains become dominant in the landscape. In the coast they are often found buried underneath middens (dumpsites) (e.g. Deacon & Deacon 1999). While in the interior regions they are sporadic and can occur across various features in the landscape.

4.8.2. Iron Age

The Early Iron Age communities first appear in southern African archaeological records in the 1st Millennium AD. During this time it is known that most of the southern Africa was occupied by the LSA hunter-gathers and the newly emerged agro-pastoralist known as the Khoekhoe herders. These early Iron Age communities selected specific routes in entering the southern African landscape. This becomes evident when one assesses the archaeological records associated with these communities. For example, the eastern regions of the country are argued to have been their preferred regions because of their rainfall patterns – summer rainfall climates conducive for ploughing and growing crops like sorghum and millet (e.g. Huffman, 1982 see also Huffman, 2007).

Stonewalls are one major characteristic of the Iron Age people – Humphreys (1988) study yielded such sites in the Northern Cape. However, stone walling is not the only characteristic of features of the Iron Age communities. Huffman (1982) described cattle dug, both vitrified and unverified, as one of the Iron Age traits. Huffman also included pits and burials, with some located inside the cattle kraals (ibid).

4.8.3. Colonial and Industrial Archaeology

The Colonial or Historical archaeology is a period in archaeological records that refers to the last 500 years when European settlers and colonialists entered into southern Africa. Noupoort is one of the interior towns that were established by the European settlers of Dutch descent – the Afrikaans communities after the Trekked from the then Cape Colony to avoid British Administration. Various monuments, statues and memorials associated with this period are found across the Northern Cape Province. The same is true with architectural structures resembling different styles and vernacular found in some of the still standing farmsteads and town buildings. Events also associated with colonial archaeology are two South African Wars commonly known as the Anglo-Boer Wars – the First South African War (1860s) and the Second South African War (late 1890s to early 1900s). The 19th Century Industrial Revolution is also closely linked to these wars and visa-versa.

4.8.4. Heritage Artefacts

The preliminary physical survey of the site yielded 3 heritage resources sites, named as follws: Klipgat-1, Klipgat-2 and Klipgatfarmstead. .

Most of the MSA stone artefacts are made from the following materials: fine grain quartzite, quartz, silcrete, chalcedony and hornfels. Like the ESA artefacts, the

MSA stone artefacts occur in secondary context owing to a variety of reasons. One is due to natural events and/or activities such as erosion and being wash down by water and riverine activities, animal and human disturbances and so forth.

Table 4.1: The archaeological artefacts found on site

 **Figure 4.5:** MSA stone scatter of approximately 8 or more stone artefacts. Please note the artefacts were collected and put together for purposes of photography.	 **Figure 4.6:** MSA stone scatter of approximately 3 stone artefacts. Please note the artefacts were collected and put together for purposes of photography.	 **Figure 4.7:** Klipgatfarmstead, located on the Farm Klip Gat 802/80
Klipgat-1 S31 03 50.2 E24 46 38.1 (WGS -84) Generally Protected C (GPC) . This is not a site in terms of site density measure but a scatter of approximately 8 or more MSA stone artefacts.	**Klipgat -2** S31 03 45.9 E24 46 36.3 (WGS-84) Generally Protected C (GPC This is a scatter of three MSA retouched stone artefacts	**Klipgatfarmstead** S31 03 54.6 E24 47 27.3 (WGS-84)Generally Protected B (GPB) The farmstead is located immediately north-east of the study area. It is not directly located within the site, but just outside on the boundary line.

SCOPING OF ISSUES ASSOCIATED WITH THE PROPOSED KLIP GAT SOLAR ENERGY FACILITY CHAPTER 5

The potential impacts of the predominant phases of the proposed development (i.e. construction and operation) are identified, described and evaluated in this chapter. The majority of the environmental impacts are expected to occur during the construction phase for a facility of this nature.

Environmental issues associated with **construction and decommissioning** activities of the PV solar energy facility are similar and include, among others:

» Impact on fauna, flora and ecology.
» Impact on agricultural potential of the site.
» Impact on soils and geology.
» Impact on heritage resources.
» Social impacts (positive and negative).

Environmental issues specific to the **operation** of the Klip Gat solar energy facility could include, among others:

» Long term loss of endangered / red list / protected species (flora, fauna, trees, mammals).
» Loss of arable land.
» Potential soil loss for the footprint of the facility.
» Visual impacts (intrusion, negative viewer perceptions and visibility of the facility).
» Social impacts (positive and negative).

Table 5.1 and Table 5.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed project respectively. Impacts associated with the decommissioning phase are expected to be similar to those associated with construction and are therefore not repeated, impacts of the proposed facility are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process.

5.1 Methodology for Impact Assessment during the Scoping Phase

The following methodology was used to determine the main issues and potential impacts of the proposed project during the scoping phase at a **desktop level** based on existing information:

» Identify **potential sensitive environments** and **receptors** that may be impacted on by the proposed facility and the **types of impacts** (i.e. direct, indirect and cumulative[3]) that are most likely to occur.
» Determine the **nature and extent of potential impacts** during the construction and operational phases.
» Identify '**No-Go' areas**, if applicable.
» Summarise the potential impacts that will be **considered further** in the EIA Phase through specialist assessments.

5.2 Assumptions made during the Evaluation of Potential Impacts

While evaluating potential impacts associated with the proposed project, it was assumed that the development footprint (the area that will be affected during the operational phase) will include the footprints for the solar components (i.e. PV panels), on-site substation and associated infrastructure (i.e. internal access roads and overhead power line). However, during the construction phase, the entire extent of the broader site required for the proposed facility could suffer some level of disturbance. This is referred to as the construction footprint.

[3] The cumulative impacts are expected to be associated with the scale of the project and any existing impacts affecting the study area. Cumulative effects can only be assessed once the detailed layouts are known. They will then be considered in the detailed specialist studies to be undertaken in the EIA Phase.

Table 5.1: Evaluation of potential impacts associated with the Construction Phase

Impacts on Fauna, Flora and Ecology

The vegetation falls within Veld Type 36 (False Upper Karoo) (Acocks, 1988) and Biome NKu4 (Eastern Upper Karoo) (Mucina & Rutherford, 2006). This biome occurs on flats and gently sloping plains, interspersed with hills and rocky areas between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north and Burgersdorp, Hofmeyr and Cradock in the east, with the great escarpment in the south. This vegetation type is the largest vegetation type mapped of all the vegetation types (49821 km2). The conservation status of the vegetation type is listed as Least Threatened (Mucina and Rutherford, 2006). Large dams have been built in this vegetation type and about 2% of the land surface has been transformed.

To the north of the proposed site the Besemkaree Koppies Shrubland (Gh4) vegetation type is found (Mucina & Rutherford 2006). This vegetation type covers approximately 9678 km2. The lower layer of the vegetation is dominated by dwarf microphyllous (small-leaved) shrubs and grasses, whereas the upper layer is dominated by tall shrubs such as Searsia erosa, Searsia burchellii, Euclea crispa and Diospyros austro-africana.

To the south-east of the site the Tarkastad Montane Shrubland (Gs17) vegetation type occurs. Ridges, hills and isolated mountain slopes characterise this vegetation type. These areas are covered with low, semi-open, mixed shrubland and prominent species include: Diospyros austro-africana, Euryops annae, Aristida spp., Cynodon incompletus and Eragrostis spp.

The ecological features on the site include:

» **Natural and Indigenous Vegetation**

» **Fauna and Fauna Habitats**

» **Seasonally washes** (these would be small drainage line areas where water only accumulates and flows during periods of high rainfall. These washes can be variable in size, may remain dry for many years, and if rainfall is sufficient, will drain into seasonal pans or larger drainage lines and rivers. They are common in the semi-arid to arid regions of the Northern Cape. Even though surface moisture may be rare in these washes, significant amounts of moisture are collected below surface to support higher and lusher vegetation compared to the surrounding areas, hence displaying an array of greener bands across the otherwise dryer landscapes).

Following construction the natural vegetation should gradually begin to recolonise the denuded areas. Although naturally occurring indigenous species will re-establish, invasive weedy species will also colonise the area and may threaten the re-establishment of the natural vegetation. The rate at which the

indigenous species re-establish will differ amongst the species and will depend on the extent of the initial disturbance and the amount and types of seeds present in the seed bank. An active re-vegetation plan should be implemented to assist the return of the natural indigenous species.

Disturbance during the construction phase will provide declared weeds and alien invader plant species an opportunity to establish on the disturbed/denuded areas. Monitoring and control of these species during the construction and operational phase of the proposed solar facility is critical. The construction of the panel foundations and associated infrastructure will lead to the disturbance and/or a direct loss of faunal habitat.
Return of the natural vegetation/habitats on denuded areas could create habitats that can be re-colonised by some faunal components. Natural habitats left between constructed areas could provide habitats for recolonisation by fauna

Runoff from the proposed solar energy facility could affect the hydrological processes in the broader landscape. The necessary measures will have to be taken in order to prevent damage to the seasonal washes. No drainage lines are indicated on the topocadastral map of the site. However, a stratification of satellite images indicates areas that could potentially be seasonal washes and this will have to be investigated further during the field survey.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Re-establishment of natural vegetation	Construction phase disturbed and/or destroyed natural vegetation which has to re-establish on the denuded/disturbed areas	Local	None.
Spread of declared weeds and alien invasive species	The spread and establishment of declared weed and alien invader species during and following construction should be monitored and controlled throughout the construction and operational phases.	Local/regional	None
Re-establishment of natural vegetation	Construction phase disturbed and/or destroyed natural vegetation which has to re-establish on the denuded/disturbed areas	Local	None
The potential impact of change in drainage patterns in the area as a result of development and its effect on the (seasonal wash) drainage system	Increased and/or decreased run-off from developed areas will have to be mitigated. Erosion and silt transportation will have to be monitored and controlled.	Local/regional	No specific no-go areas have been identified at this stage, to be determined in the EIA phase

Gaps in knowledge & recommendations for further study

It is recommended that:

» A site survey be conducted at the appropriate time of the year in order to assess the current state of the vegetation that will be lost and/or disturbed and the implication thereof
» Sensitive areas must be identified and mitigation measures put in place.
» Potential weedy species in the area be identified and the accompanying risks assessed.
» Faunal habitats be assessed on the site
» Sensitive faunal species and habitats must be identified and mitigation measures put in place

Impacts on Agricultural Potential and Land-Use

The site is situated in a Relative Homogenous Farming Area with an area of 208 350ha. The area of the site (848ha) represents less than 0,5% of this area, while the carrying capacity is at best 53 large stock units, making the site insignificant in terms of agricultural production and food security.
This region is categorized as non-arable with low to moderate potential grazing land. The "best use" for the area is for grazing with sheep, goats and beef cattle. There are no cultivated lands visible on either the topographic maps or Google Earth Images of the site (to be confirmed during the site visit).

The size of the site is relatively insignificant when compared to the area of the Relative Homogeneous Farming Area it represents, as well as the total carrying capacity. The site is relatively poor in terms of agricultural potential and is suitable for extensive grazing purposes only. It does not appear that the site consists of unique agricultural land. There is no evidence that any part of the site is currently under cultivation or has been cultivated the last ten years. The absence of cultivated lands should be verified during the full EIA process to ensure that no development takes place on them. There is no evidence that the site has agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, grazing camps, animal housing, farm roads, etc.) or any conservation works (i.e. contour banks, waterways, etc.) that will be interfered with.

There are no watercourses or wetlands visible on the topographic maps or Google Earth Images of the site. The absence thereof will be verified during the full EIA process to ensure that no development takes place within or near any of them. There are no slopes in access of 20% on the site. This should be verified during the full EIA process. The site has a low to medium hazard for both water and wind erosion.

The identified potential impacts are the following (with the potential significance in brackets):
>> Soil degradation due to contamination by diesel, oil, petrol and other contaminants used during the construction phase by vehicles and equipment (Low to High, depending on the magnitude and nature of a spillage of contaminants)
>> Soil erosion due to increased and concentrated storm water run-off (Medium, if not properly managed)

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Loss of arable land	Improper placement of the wind turbines or other infrastructure within the existing lands	Local	None identified at this stage.
Interference with agricultural important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.)	Improper placement of the wind turbines or other infrastructure within existing infrastructure or conservation works.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study

» The agricultural potential of the site is considered low and the proposed activity will not have any significant effect on this status. Due to low agricultural potential of the soils and the prevailing climatic limitations for agriculture, impacts are expected to be of low significance.

» Significant impacts to be assessed during the EIA phase: Consideration should be given to the proper placement of the solar arrays and other infrastructure.

Impacts on Soils and Geology

The proposed solar energy facility may have certain impacts on the geological environment and soils which may indirectly affect other natural processes. The geological environment includes the bedrock and the soil cover. The following activities may have an impact on the soil and agricultural potential and resources of the site:

» Construction and positioning of the concrete foundations of the solar arrays

» Positioning and construction of underground cabling between the solar arrays

» Construction and positioning of the on-site substation

» Construction and positioning of overhead power lines

» Construction and positioning of internal access roads

» Construction and positioning of a workshop, office, maintenance and storage area

» Contamination of the soil and other resources by oil, petrol, diesel and other contaminants by the vehicles and equipment on the site

The Soil susceptibility to wind erosion for the proposed site indicates that the site is "somewhat susceptible" (Figure 5.3)

Issue	Nature of Impact	Extent of Impact	No Go Areas
Soil degradation due to contamination	Spillages of oil, diesel, petrol or other contaminants by the vehicles and equipment, may lead to soil degradation due to contamination. Contamination of the soil may also take place in proposed maintenance and storage sites	Local	None identified at this stage
Soil erosion due to increased and concentrated storm water run-off	Heavy rainstorms do occur in the area. Depending on the placement of the solar arrays and other infrastructure, as well as the erodibility of the soils and the slopes on the site, run-off of storm water may be increased and concentrated, with both direct and secondary effects on the soil, vegetation and other resources downstream.	Local	None identified at this stage
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	Improper placement, construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to the degradation of the soil surface and result in soil erosion (both wind and water erosion).	Local	None identified at this stage
Siltation of watercourses and other natural resources	Improper placement and maintenance of infrastructure, as well as poor storm water management, may lead to water erosion and siltation of water courses downstream.	Regional	None identified at this stage

downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off			
Dust production	Improper construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to dust production.	Local	

Gaps in knowledge & recommendations for further study

» Potentially significant impacts to be assessed during the EIA phase: Due diligence should be observed in terms of the proper placement of solar panels and other infrastructure, as well as the slopes and erodibility of the soils present on the site.

» Consideration should be given to the proper placement of roads and other infrastructure, taking into account the sensitivity of the soils to wind and water erosion and the slopes present on the site. Consideration should also be given to storm water management next to roads and construction sites, as this may cause secondary effects, i.e. soil erosion.

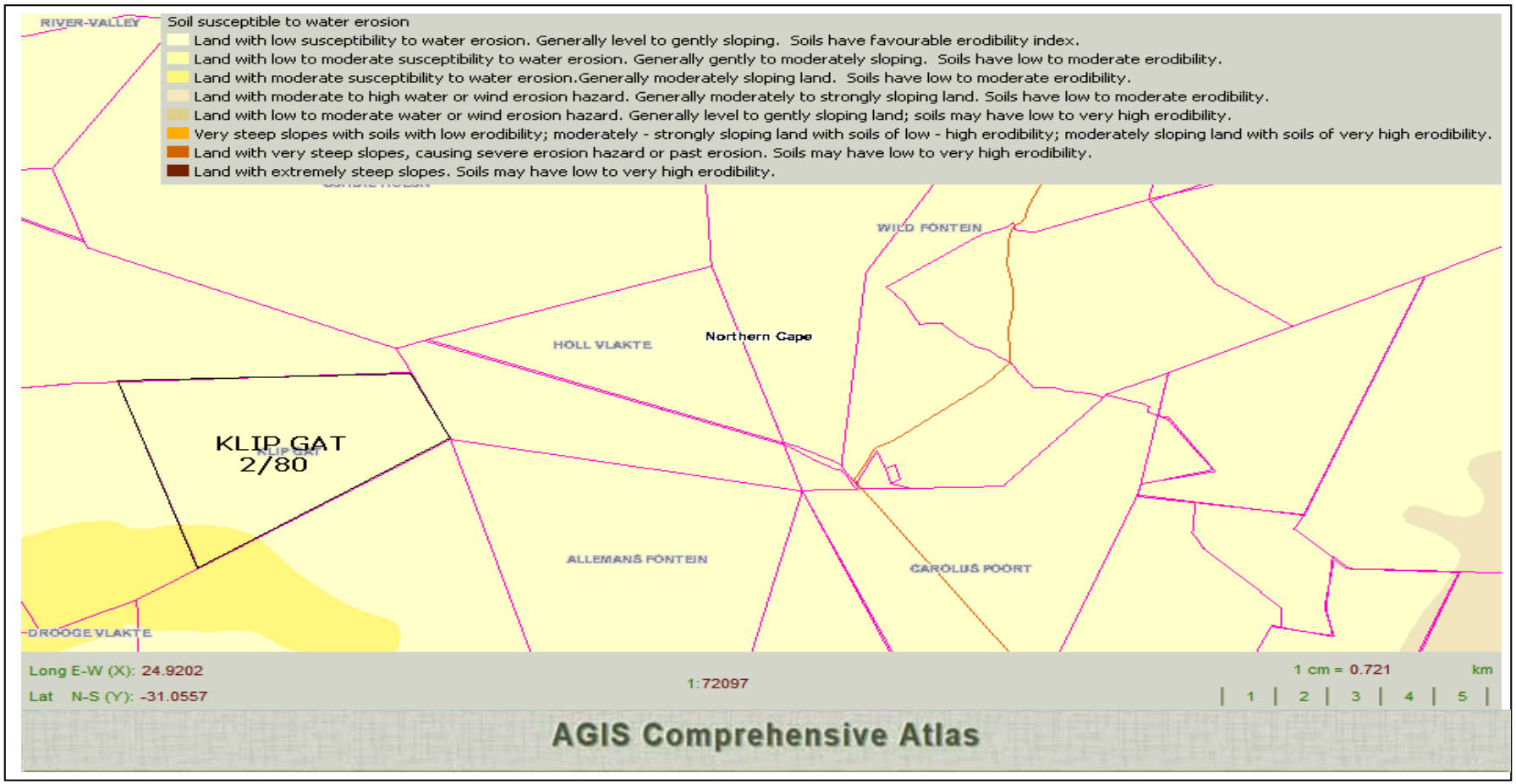

Figure 5.1 Soil susceptibility to water erosion (Low to moderate water or wind erosion)

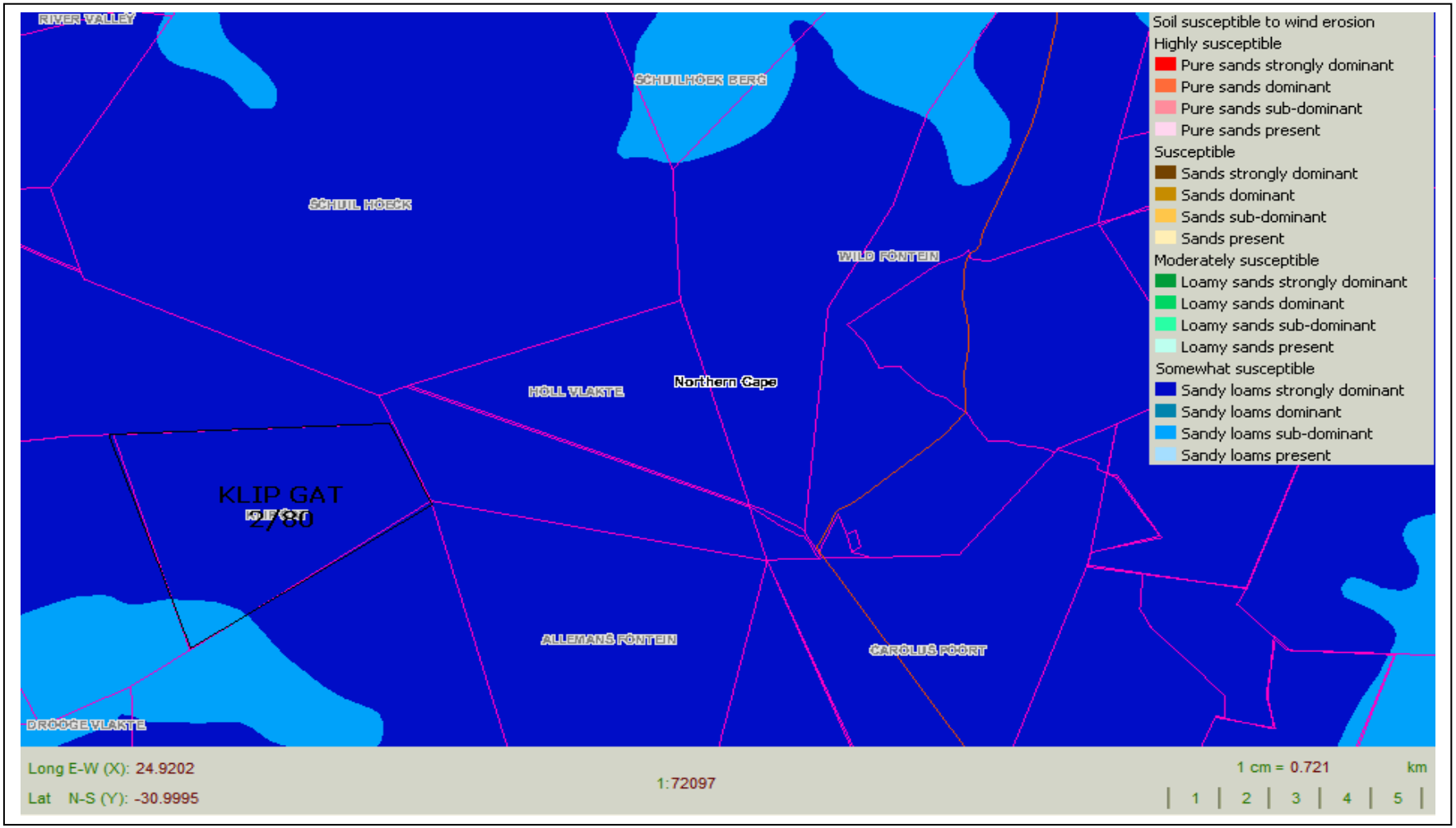

Figure 5.2 Soil susceptibility to wind erosion (somewhat susceptible)

Heritage Impacts

Based on archaeological experience in the region, the following heritage sites, features and objects are expected to occur in the proposed development area:

» Stone Age
» Iron age
» Colonial and Industrial Archaeology

The preliminary field survey of the proposed development area (PDA) yielded a number of interesting heritage features or sites concentrated in one section that have the potential to influence decision making in the EIA process.

In total approximately 3 sites were observed during the preliminary survey and they are named and numbered as NaauwP-1 to NaauwP-4. Below is the location of each site, and field significance:

» Klipgat-1(MSA stone scatter) S31 03 50.2 E24 46 38.1 (WGS -84), Generally Protected C (GPC)

» Klipgat -2(MSA stone scatter) S31 03 45.9 E24 46 36.3 (WGS-84), Generally Protected C (GPC

» Klipgatfarmstead (The farmstead is located immediately north-east of the study area. It is not directly located within the PDA, but just outside on the boundary line.) S31 03 54.6 E24 47 27.3 (WGS-84), Generally Protected B (GPB)

The proposed Klip Gat Solar Energy Facility is located in an area that is underlain by potentially fossiliferous sedimentary rocks. The construction phase will entail excavations for fencing, underground cabling, access roads and administrative buildings. These activities may adversely affect paleontological heritage within the proposed area by permanently sealing-in fossiliferous mudstones and/or destroying important fossils. The impacts are however limited to the construction phase and no adverse impacts on palaeontological heritage are foreseen during the operational and decommissioning phases.

Construction activities such as clearing of land for the PV facility, shallow excavations for the PV panel mountings, substation and invertors and well developing access roads could lead to loss or damage of heritage resources.

Issue	Nature of Impact	Extent of	No Go Areas

		Impact	
Archaeological (Stone Age (ESA, MSA & LSA); Iron Age, Rock Art; & Historic Archaeology)	Construction activities such as clearing for roads or PV panels and shallow excavations may lead to damage or loss of stone age features.	Local	There are no "No Go Areas" identified in terms archaeological resources. All sites identified are scatters with low density
Historical, Built Environment & Landscape (incl. Industrial)	Construction of the solar energy facility activities such as clearing for roads or PV panels and shallow excavations may lead to damage or loss of the built environment.	None	None.
Burial Grounds & Grave	Construction of the solar energy facility activities such as clearing for roads or PV panels and shallow excavations may lead to damage to graves.	None	None.
Palaeontological	Construction activities such as clearing for roads or PV panels and shallow excavations may lead to damage or loss of fossils. .	Local	There are no "No Go Areas" identified at this stage.

Gaps in knowledge & recommendations for further study:

» The following assumptions and limitations exist in terms of the present study:

» A Phase 1 Archaeological Impact Assessment will be undertaken in line with the NHRA.

» The current study is a Heritage Scoping study and not heritage impacts or impact evaluations took place. As such, a historical and archival desktop study as well as a preliminary field survey were undertaken to identify tangible heritage resources located in and around the proposed area of development. No archival maps that can potential yield more information about the site were identified – as such this limits us some information about the documented historical events of the area. No semi-formal discussions took place with the farm owners or potential Interested and Affected parties were undertaken as part of this study- therefore there was no heritage based Social Consultation Process.

» The Deed search at the National Archives in Pretoria also did not yield any information about previous farm owners of the farms affected – this may limit the study in terms of understanding the different cultural activities that took place in the affected farms and why such activities took place. As such as some of the area's intangible heritage and stories maybe be missing.

» A qualified palaeontologist undertakes ground reconnaissance prior commencement of the development.
» Fossiliferous mudstones exposed during construction are reported to a qualified palaeontologist and the South African Heritage Resources Agency (SAHRA).

Visual Impacts

The project site presents a typical Karoo landscape. It is not identified as an area of outstanding rural quality. Nonetheless, the proposed activity will be measured in terms of this landscape. The proposed activity is situated outside the demarcated urban edge of the nearest town and will be assessed accordingly. The prevailing use will change on approximately 150ha. Should the proposed mitigation measures be implemented, the prevailing use could be retained to a degree. The proposed activity will form an integral part of the future landscape character. The extent and significance of a possible visual impact is to be determined through this VIA.

The closest towns located near the proposed site is Noupoort which is approximately 20 km south East of the site and Hanover which is approximately 30 km north west of the site.

Construction related activities which could impact on the overall visual aesthetics of the study site include construction of access roads and foundations, and establishment of the power line. A total of 10 Key Observation Points (KOPs) were provisionally identified and selected within the defined viewshed for the visual assessment in accordance with the selection criteria stipulated in the Visual Guidelines. These KOPs correspond with movement routes, major farmsteads and residential areas in the region. The description and assessment of the individual KOPs will be included as part of the EIA phase.

KOPs selected for the assessment are generally located at the intersection between the zone of visual influence and the defined view corridors. The view corridors are those areas that are accessible to the general observer.

Construction periods are often characterised by an increase in construction vehicles and personnel and their associated impacts such as dust clouds, noise, potential pollution, safety considerations, etc.

Issue	Nature of Impact	Extent of Impact	No Go Areas
Visual impacts	Potential visual impact of the construction period on visual receptors.	Regional	None identified at this stage

Gaps in knowledge & recommendations for further study:

» Visual impacts during the construction phase are expected to be limited to the site and of short duration. These impacts are therefore not expected to be of significance and will not require detailed assessment in the EIA phase.

Impacts on the social environment

The main negative impacts are associated with the intrusion impacts associated with the construction phase. The most important potential social benefits associated with the construction of the project refer to the job opportunities and possible socio-economic spin-offs created, even of a very limited scale.

Potential social impacts during construction include:
» Job creation (positive impact) – limited opportunities
» Economic spin-offs to local community (positive impact)
» Safety and security risks to farmer's property and livestock (negative impact) due to influx of job seekers to the area
» Construction traffic (negative impact)

These impacts are discussed below.

Issue	Nature of Impact	Extent of Impact	No Go Areas
Temporary job creation during construction phase.	Limited employment opportunities would be available during the construction phase. Even though the area has a low population density and education levels are low, it is still anticipated that there would be sufficient unemployed individuals that could be sourced as labourers for the unskilled to semi-skilled work required. Skilled positions would probably be filled by outsiders.	Local - Regional	None identified at this stage
Economic spin-offs to local community.	Due to construction activities, the small workforce will need accommodation and supplies. Other economic spin-offs include Local procurement of general construction materials and goods (e.g. cement, sand / stone etc.).	Local	None identified at this stage
Influx of people into the study areas including members of the construction crews and job seekers.	An increase in people movement could increase the safety and security risk and fire risk in the area. Furthermore, the influx of job seekers to the construction site could lead to some negative impacts (i.e. conflict between individuals seeking work). An inflow of workers and the associated construction activities (vehicle movement, noise, dust) could result in temporary intrusion impacts.	Local	None identified at this stage

Skills development	Potential opportunities for skills development and training during the construction phase would result in long-term benefits for those involved. If proper enhancement measures are implemented the positive impacts in this regard could be increased.	Local - Regional	None identified at this stage
Security issues	Even though no construction workers are expected to be accommodated on site, an inflow of workers could, as a worst case scenario also pose some security risks. The negative impacts associated with the inflow of workers could, however, be limited should a local labour force be used.	Local	None identified at this stage
Disturbance of surrounding landowners	Temporary disruptions in the daily living and movement patterns of neighbouring private property owners could be foreseen, although it is anticipated that the negative impacts associated with this aspect would be minimal and could be successfully mitigated.	Local	None identified at this stage

Gaps in knowledge & recommendations for further study

The following activities will be undertaken as part of the Social Specialist Study during the EIA Phase:

» A comprehensive literature review and analysis would be undertaken in order to acquire further demographic and socio-economic information with regards to the receiving environment and to build on the initial profiling of the local population's socio-economic characteristics.
» A site visit would be undertaken in order to gather additional primary data by means of consultation with the stakeholders and affected parties.
» If available, the social impact assessment team will study and analyse the information gathered by the biophysical studies (e.g. information related to technical, environmental, economic and demographic aspects and land-use changes, impact on other facilities, services, and so forth) done in parallel with the public participation process and social studies. This would assist the social team to assess the impact of the proposed development on the direct (surrounding communities) and indirect (regional) environment.
» The following variables would also be assessed:
  * Population impacts;
  * Community/institutional arrangements;
  * Conflicts between local residents and newcomers;
  * Individual and Family level impacts;
  * Community infrastructure needs; and
  * Intrusion impacts.
» Prepare a specialist report detailing the potential social impacts.
» Assess these potential impacts using a weighting system that assigns a value to the categories (extent, duration, magnitude, probability) and arrives at a total which depicts the significance of the particular impact.

Table 5.2: Evaluation of potential impacts associated with the Operational Phase

Impacts on Fauna, Flora and Ecology

Following construction the natural vegetation should gradually begin to recolonise the denuded areas. Although naturally occurring indigenous species will re-establish, invasive weedy species will also colonise the area and may threaten the re-establishment of the natural vegetation. The rate at which the indigenous species re-establish will differ amongst the species and will depend on the extent of the initial disturbance and the amount and types of seeds present in the seed bank. An active revegetation plan should be implemented to assist the return of the natural indigenous species

Disturbance during the construction phase will provide declared weeds and alien invader plant species an opportunity to establish on the disturbed/denuded areas. Monitoring and control of these species during the construction and operational phase of the proposed solar facility is critical.

Return of the natural vegetation/habitats on denuded areas could create habitats that can be re-colonised by some faunal components. Natural habitats left between constructed areas could provide habitats for recolonisation by fauna.

Runoff from the proposed solar energy facility could affect the hydrological processes in the broader landscape. The necessary measures will have to be taken in order to prevent damage to the drainage system.

Issue	Nature of Impact	Extent of Impact	'No go' Areas
Re-establishment of natural vegetation	Construction phase disturbed and/or destroyed natural vegetation which has to re-establish on the denuded/disturbed areas	Local	None
Spread of declared weeds and alien invasive species	The spread and establishment of declared weed and alien invader species during and following construction should be monitored and controlled throughout the construction and operational phases.	Local/regional	None
Re-colonisation of habitats	Re-colonisation of suitable habitats by fauna following the construction phase	Local	Sensitive habitats are to be avoided
The potential impact of change in drainage patterns in the area as a	Increased and/or decreased run-off from developed areas will have to be mitigated. Erosion and silt transportation will have to be monitored and controlled.	Local/regional	Sensitive areas are to be avoided

result of development and its effect on the drainage system			

Gaps in knowledge & recommendations for further study

It is recommended that:

» At the appropriate time of the year a site survey should be conducted in order to assess the current state of the vegetation that will be lost and/or disturbed and potential for revegetation investigated.
» The site survey should identify potential weedy species in the area and assess the accompanying risks.
» Faunal habitats be assessed on the site
» Sensitive areas and faunal species must be identified and, where necessary, mitigation measures put in place.
» Sensitive areas be identified and mitigation measures put in place to prevent/limit damage to the drainage system.

Impacts on Agricultural Potential

The site is relatively poor in terms of agricultural potential and is suitable for extensive grazing purposes only. The soils are generally shallow and the effective depth varies between 30mm and 1200mm (Land Type Survey Staff, 1987). The clay content varies between 15% and 30% in the A-horizon, and between 10% and 45% in the B21-horizon. Considering the soil types and soil depths occurring in the area puts the site in a category of "not suitable for cultivation". At the end of the project life, it is anticipated that removal of the structures would enable the land to be rehabilitated and used for a suitable land-use / activity.

Issue	Issue	Extent	No go' Areas
Long term loss of arable land	Loss of arable land, however, at the end of the project life, it is anticipated that removal of the structures and rehabilitation of the site would allow for a suitable land-use / activity to occur on the site.	Local	None identified at this stage

Gaps in knowledge & recommendations for further study

Due mainly to the low agricultural potential of the soils and the prevailing climatic limitations for agriculture, the potential impacts on agricultural potential are expected to be of low significance and therefore it is extremely unlikely that any sort of detailed soil investigation will be necessary during the EIA Phase. Therefore the recommendation has been made that no further studies regarding agricultural potential would be required to be undertaken during the EIA Phase.

Impacts on Geology and Soils

During the operation of the solar energy facility, exposed areas / soil could be susceptible to wind/water erosion in the absence of soil erosion control measures. Soil contamination is possible, however marginal due to limited / no use of oils, diesel or fuels as maintenance PV panels require little in the way of maintenance (if pollen, dirt, dust, leaves, and other debris collect on the panels, it can be removed by spraying of water on the panels).

Issue	Nature of Impact	Extent of Impact	No go' Areas
Soil erosion	Accelerated loss of sediment cover through rainfall or artificially concentrated run-off may occur.	Local	None identified at this stage

Gaps in knowledge & recommendations for further study

The following activities will be undertaken as part of the Geological / Soils Specialist Study during the EIA Phase:

» Conduct a site visit to confirm the physical and geological information used in this report and to collect visual information pertaining to the soil types and their geotechnical engineering properties;
» Assess the present state of erosion, identify critical areas in terms of erosion and identify these areas;
» Prepare a specialist report detailing the environmental issues and potential impacts pertaining to soil degradation and erosion;
» Assess the potential direct and indirect impacts using a weighting system that assigns a value to the categories (extent, duration, magnitude, probability) and arrives at a total which depicts the significance of the particular impact;
» Assess the contribution of the proposed activity in the cumulative impact of the development in the area;
» Comparatively assess any feasible alternatives (if any);
» Provide mitigating measures to input into the Environmental Management Programme (EMP).

Visual Impacts

As a first step of this VIA, a survey was undertaken to determine the existence of significant view corridors associated with the project site. A view corridor is defined as 'a linear geographic area, usually along movement routes, that is visible to users of the route. Accordingly, four dominant view corridors were identified in the region, namely:

a) N1- The main movement corridor between Cape Town and Johannesburg.
b) N9- The main movement corridor that run across the spine of the country from Port Elizabeth to Upington, via Cradock, Middelburg, Hanover, De Aar and Groblershoop.
c) N10- A main movement route between Colesberg in the Northern Cape and Graaff-Reinett in the Eastern Cape.
d) R389- A secondary road linking the N9 in the east with the N1 in the west.

The only relevant view corridor is that of a minor farm road, which runs parallel to the De Aar – Noupoort railway line, north of the project site.

The topography and the major ridgelines of the area were subsequently determined and mapped by using a Digital Elevation Model[4]. , the project site is located at a mean elevation of approximately 1407m above sea level on a slight downward northerly slope. The DEM shows that there are very few prominent topographical manifestations in close proximity to the project site from which the proposed activity is particularly visually exposed. The nearest prominent hill or mountain is that of Schuilhoekberg at some 1625m, situated some 7km north of the project site.

The project site is located below any ridgeline. The proposed activity will therefore not impact on the skyline **Digital Viewshed Analysis**

The photographic study summarised above was supplemented with a digital viewshed analysis based upon the Digital Elevation Model. The purpose of these two steps was to provide a basis for the identification and selection of appropriate observation points outside the project site for the VIA.

[4] A Digital Elevation Model (DEM) is a geographic information system-based outcome generated from contours for a specific area. In this instance, 20m contour intervals for reference sheet nos. 2228bd, 2228db, 2229ac, 2229ad, 2229ca, 2229cb, 2229bc and 2229da were used to calculate the DEM for the region.

The viewshed[5] analysis was undertaken in accordance with the Guideline Document for involving Visual Specialists in EIA Processes. Geographic Information Systems (GIS) technology was used to analyse and map information in order to understand the relationships that exist between the observer and the observed view. Key aspects of the viewshed are as follows:

- It is based on a single viewpoint from the highest point of the project site.
- It is calculated at an assumed 3.4m above the natural ground level to reflect the highest point of the PV panels.
- It represents a 'broad-brush' designation, which implies that the zone of visual influence may include portions that are located in a view of shadow and it is therefore not visible from the project site and vice versa. This may be as a result of landscape features such as vegetation, buildings and infrastructure not taken into consideration by the DEM.
- The viewshed generated from each of the selected observation points is calculated at 1.7m above the natural ground level to reflect the average height of person either walking or sitting in a vehicle.

As illustrated by the generated viewsheds (refer to Figure 5.3 below), the zone of visual influence6is primarily located in a northern direction. The zone of visual influence extends in a north-western direction up to 15km and in a north-eastern direction up to 20km from the project site. The zone of visual influence is closely associated with the most prominent topographical features to the north.

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The GIS-generated viewshed illustrates a theoretical zone of visual influence. This does not mean that the proposed activity would be visible from all observation points in this area. The GIS-generated viewshed and expected visual impact will be assessed by means of ground truthing that will be undertaken as part of the EIA process.

The distance radii indicating the various viewing distances from the combined sites/phases are illustrated by Figure 5.2. Also illustrated by the figure are the view corridors of the N1 and R389. These corridors are all situated in the background to the project site and should therefore not be affected by the proposed activity.

[5] A viewshed is defined as *'the outer boundary defining a view cathment area, usually along crests and ridgelines. Similar to a watershed'*. A Viewshed Analysis is therefore the study into the extent to which a defined area is visible to its surroundings.

[6] Zone of visual influence is defined as *'An area subject to the direct visual influence of a particular project'.*

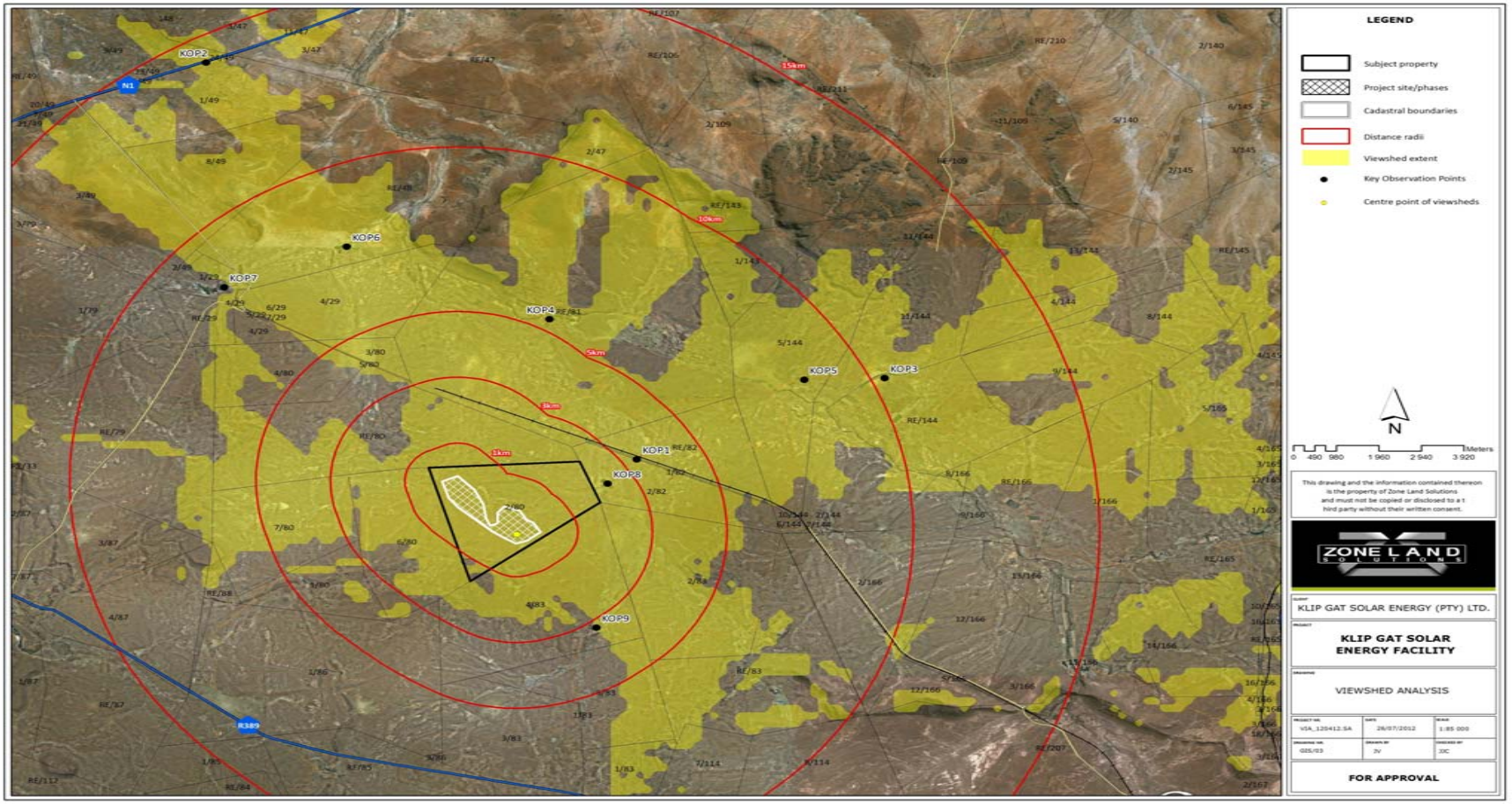

Figure 5.4: Potential visual exposure of the proposed facility

Issue	Nature of Impact	Extent of Impact	No go' Areas
Potential visual impact of the proposed facilities on sensitive observers beyond 3km from the project site.	The PV panels and associated infrastructure such as access roads, substation and power line.	Local (without mitigation)	To be determined in EIA phase once viewshed have been confirmed.
Change in character of the prevailing use of the area.	The PV panels and associated infrastructure such as access roads, substation and power line	Local (without mitigation)	To be determined in EIA phase once viewshed have been confirmed.
Introduction of artificial light sources in a rural landscape.	Associated infrastructure of the solar energy facility (i.e. workshop area, storage area and offices).	Local (without mitigation)	To be determined in EIA phase once viewshed have been confirmed.
Reflection of the PV panels on the sensitive receptors in the region.	PV panels.	Local (without mitigation)	To be determined in EIA phase once viewshed have been confirmed.

Gaps in knowledge & recommendations for further study:

The above-mentioned anticipated visual impacts need to be assessed in greater detail during the EIA phase of the project.

It is recommended that:

» The severity of the potential visual impact be assessed in further detail in the EIA phase.
» Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact.
» Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact.
» Specific mitigation measures be proposed to lessen any potential visual impact (with specific mention to the height contours).
» Ground truthing of the GIS-generated viewshed be undertaken to determine/confirm actual visual impact.

Impacts on the social environment

During the operation phase the potential exists for further, albeit limited, job creation and some skills development (positive impacts). However, there is also the potential for impacts on the social dynamics of the study area. The proposed project could assist with decreasing South Africa's dependency on coal generated electricity thereby strengthening the electricity grid in an "environmentally friendly" way. On a regional scale it could possibly result in positive changes in the quality of lives of many individuals currently living without an efficient and satisfactory electricity supply. On a national scale, the proposed project could fit in with the government's aim to develop a concentrated zone of solar development in the Noupoort area, and would also assist in meeting the government's target for renewable energy.

Issue	Nature of Impact	Extent of Impact	No go' Areas
Employment opportunities	A PV facility usually does not require large numbers of employees during its operational lifespan and limited maintenance. The limited number of individuals to be employed during the operational phase of the project would be responsible for maintenance of the solar energy facility (e.g. cleaning of panels / security personnel). Maintenance of the local gravel roads could furthermore result in more jobs created, although possibly only on a temporary scale. The limited daily movement of workers to and from the site is thus not expected to have any marked impacts on the social environment. Capacity building and skills development throughout the life of the facility could be to the benefit of the employees and could assist them in obtaining transferable skills. During the operational phase, local procurement for general materials, goods and services (e.g. catering and security) could materialise	Local - Regional	None identified at this stage
Safety and security impacts on the site and surrounds.	The presence of the solar energy facility could prompt criminals to enter the site or surrounding properties through the site. Indirectly, possible illegal poaching of game and animals / general theft could occur. However, the facility will be fenced and the use of security measures to limit / prevent significant safety / security impacts.	Local	None identified at this stage
Contribution of clean energy.	On a national scale the project is anticipated to have positive environmental impacts through the "greener" technology that will be used (no use of fossil fuels / no noise / no emissions	National	None identified at

	and so forth). The proposed project could therefore assist in meeting the government's target for renewable energy while contributing to sustainable development in the country.		this stage

Gaps in knowledge & recommendations for further study

The Social Impact Assessment study will be conducted during the EIA Phase including:

» A further literature review
» Public consultation sessions and fieldwork
» An analysis of the social data collected
» Impact assessment (rating) and providing mitigation measures

Table 5.3: Evaluation of potential impacts associated with the Klip Gat Solar Energy Facility

» **Approach to Cumulative Effects Assessment**

Cumulative impacts, in relation to an activity, refer 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 activities or undertakings in the area. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully (DEAT, 2004). Boundaries must be set so analysts are not attempting to measure effects on everything. Therefore, the cumulative impacts associated with the proposed Klip Gat Solar Energy Facility have been viewed from two perspectives within this EIA:

I. Cumulative impacts associated with the scale of the project,

II. Cumulative impacts associated with other relevant approved or existing wind developments in the area. (In the case of the latter, no existing commercial or renewable energy facilities exist in South Africa therefore this is not relevant for this site).

Based on the information available at the time of undertaking this EIA,, no other renewable energy facilities have environmental authorisations in close proximity to the Klip Gat Solar Energy Facility.

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts (DEAT, 2004). The complicating factor is that the projects that need to be considered are from past, present and reasonably foreseeable future development. Cumulative effects can be characterised according to the pathway they follow. One pathway could be the persistent additions from one process. Another pathway could be the compounding effect from one or more processes. Cumulative effects can therefore occur when impacts are:

* additive (incremental);
* interactive;
* sequential; or
* synergistic.

Canter and Sadler (1997) describe a three step process for addressing cumulative effects in an EIA:

* delineating potential sources of cumulative change (i.e. GIS to map the relevant wind energy facilities in close proximity to one another.

* identifying the pathways of possible change (direct impacts)
* indirect, non-linear or synergistic processes; and
* Classification of resultant cumulative changes

» **Potential Cumulative Impacts**

The cumulative impacts associated with the proposed Klip Gat solar energy facility at a site level are expected to be associated with the scale of the project. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual, soil, and heritage impacts in the surrounding area. These cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase.

In addition to cumulative impacts at a site level, cumulative impacts could be associated with this proposed development and other similar developments in the area. At this stage, no other renewable energy facility projects have been authorised in the area.

Gaps in knowledge & recommendations for further study:

» Each specialist study will consider the cumulative impacts on the site.
» The impact assessment will consider the operation phase as well as cumulative impacts.

CONCLUSIONS CHAPTER 6

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility (75 MW) on a site approximately 20 km north west of Noupoort, Northern Cape Province. The project is known as the **Klip Gat Solar Energy Facility (75MW)** (Figure 6.1).

The Draft Scoping Report for the proposed Klip Gat PV Solar Energy 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).

This Draft Scoping Report is aimed at detailing the nature and extent of this facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the "do nothing" option) have been identified for consideration within the EIA process.

The conclusions and recommendations of this Draft Scoping Report are the result of on-site inspections, desk-top evaluations of impacts identified by specialists, and the parallel process of public participation. The public consultation process is extensive and every effort is being made to include representatives of all stakeholder groupings in the study area and the Province.

A summary of the conclusions of the evaluation of the proposed solar energy facility is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 7 of this report.

6.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of a Solar Energy Facility

The Klip Gat PV solar energy facility and associated infrastructure is proposed on Portion 2 of Farm Klip Gat 80 which is located approximately 20 km north west of Noupoort. The site covers an area of approximately 848 hectares, which is much larger than the development footprint which is estimated to be 115 hectares (to be finalised depending on the layout of the facility) for the facility. The facility

can therefore be appropriately placed within the boundary of the larger site taking any identified environmental and other constraints into account.

The facility is proposed to have an installed capacity of up to 75 MW which will be comprised of PV panels and associated infrastructural requirements which will include:

» An array of photovoltaic (PV) panels.
» A new on-site substation to evacuate the power from the facility into the Eskom.
» The substation is proposed to be connected via a loop-in loop-out connection to the existing Linde/Carolus 132kV power line and there will be an upgrade or construction of a new power line.
» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling between the project components, to be lain underground where practical.
» Internal access roads and fencing.
» Workshop area for maintenance, storage, and offices.

The main issues identified through this scoping study associated with the proposed solar energy facility are summarised in Table 6.1

Table 6.1: Summary of significance of the potential impacts associated with the proposed PV solar energy facility development

Construction / Decommissioning Impacts	**Extent**
Re-establishment of natural vegetation	L
Spread of declared weeds and alien invasive species	L-R
Re-colonisation of habitats	L
The potential impact of change in drainage patterns in the area as a result of development and its effect on the drainage system	L-R
Loss of arable land	L
Interference with agricultural important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.)	L
Soil degradation due to accelerated erosion (water or wind)	L
Soil degradation due to contamination	L
Soil erosion due to increased and concentrated storm water run-off	L
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	L
Siltation of watercourses and other natural resources downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off	R
Degradation of (seasonal wash) watercourses	R
Dust production	L
Loss or destruction of Archaeological sites	L
Loss or destruction of Palaeontological sites/ fossils	L
Visual impacts during construction	R
Temporary job creation during construction phase	L-R
Economic spin-offs to local community.	L
Influx of people into the study areas including members of the construction crews and job seekers	L
Skills development	L-R
Security issues	L
Disturbance of surrounding landowners	L
Operational Impacts	Extent
Re-establishment of natural vegetation	L

Spread of declared weeds and alien invasive species	L-R
Re-colonisation of habitats	L
The potential impact of change in drainage patterns in the area as a result of development and its effect on the drainage system	L-R
Long term loss of arable land	L
Soil erosion	L
Potential visual impact of the proposed facilities on sensitive observers beyond 3 km from the project site	L
Change in character of the prevailing use of the area	L
Introduction of artificial light sources in a rural landscape	L
Reflection of the PV panels on the sensitive receptors in the region	L
Employment opportunities	L-R
Safety and security impacts on the site and surrounds	L
Contribution of clean energy	N

L **Local** R **Regional** N **National** I **International**

As can be seen from the table above, the majority of potential impacts identified to be associated with the construction of the solar energy facility are anticipated to be localised and restricted to the proposed site itself (apart from social impacts – job creation which could have more of a regional positive impact), while operational phase impacts range from local to regional and national (being the positive impact of contribution of clean energy as part of the energy mix in South Africa). However, areas of potential environmental sensitivity were identified through the scoping phase. These include areas within the site that has two stone artefacts on site, a moderate susceptibility to water erosion (portion of the site), and the dominate corridors such as the farm stead (within 2 km of the and the access road(within 3 km) of the proposed development site.

The sensitivity map is a rough scale estimate of sensitivity on the site identified at a desk-top level. These areas will be subject to survey and ground-truthing during the EIA phase of the project. This map does not represent no-go areas but rather an outline of potentially sensitive areas identified through scoping within which more detailed investigation is required. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase of the process (refer to Chapter 7 for more details). The map will be further refined in the EIA phase on the basis of these specialist studies, in order to inform the final design of the facility. In order to assess potential impacts within sensitive areas, the preliminary layout for the solar energy facility will be considered in the EIA phase.

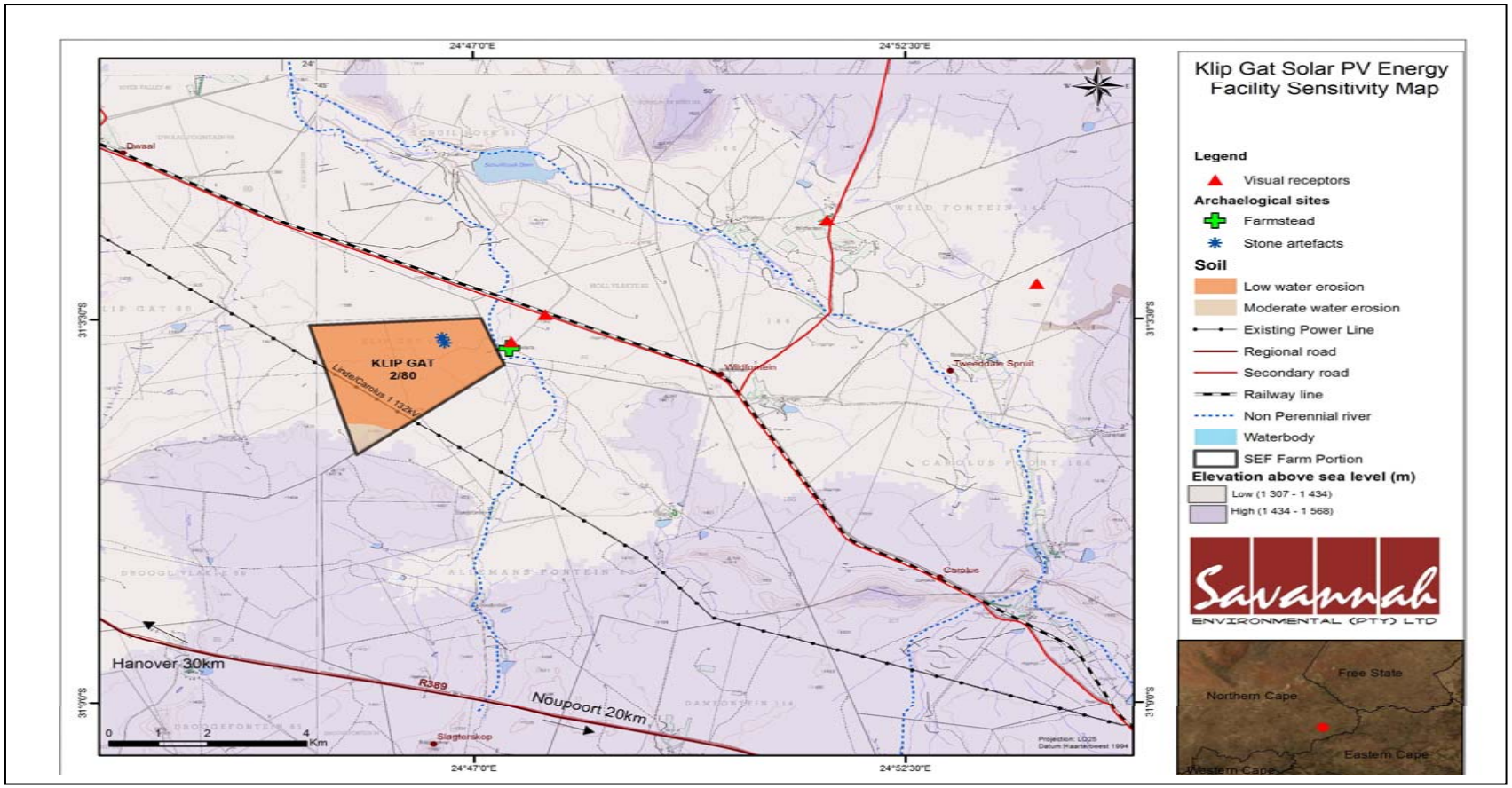

Figure 6.1: Desktop Environmental Sensitivity Map of the proposed Klip Gat Solar Energy Facility showing heritage sites, erosion sensitivity areas and visual receptors in the region

The potentially sensitive areas/environmental features/issues that have been identified (as shown in Figure 6.1) for further study include:

» **Erosion sensitivity of the soils on the site**

The soils on the site have a low susceptibility to water erosion and a portion of the site (the south-western edge of the site) is of moderate susceptibility to water erosion. The area that is of moderate susceptibility may consist of gentle slopes/ ridges. The site preparation would involve disturbance due to clearing and shall excavations, which would leave the site vulnerable to erosion. It is therefore recommended that perennial grasses which occur naturally in the area are considered for proactive use post-construction to stabilise the site after it has been disturbed. The layout/ design of the facility should avoid the steeper parts of the site as far as possible. In addition, good soil management and soil erosion control measures will be included in the EMP to migitage and avoid excessive erosion.

» **Heritage Artefacts –**

Two archaeological sites (stone artefacts) were identified and included: Klip Gat 1 and Klip Gat 2.

The areas around sites Klip Gat 1 and Klip Gat 2 are marked on the map (Figure 6.1) and are considered to be sensitive from an archaeological point of view. Any no go areas will be determined and confirmed during the EIA phase.

» **Visual**

Four dominant *view corridors (linear geographic area, usually along movement routes*Accordingly) were identified in the region, namely: N1 (The main movement corridor between Cape Town and Johannesburg), N9 (The main movement corridor that run across the spine of the country from Port Elizabeth to Upington, via Cradock, Middelburg, Hanover, De Aar and Groblershoop.), N10 (A main movement route between Colesberg in the Northern Cape and Graaff-Reinett in the Eastern Cape), R389 (A secondary road linking the N9 in the east with the N1 in the west).

The only relevant view corridor is that of a minor farm road, which runs parallel to the De Aar – Noupoort railway line, north of the project site. This is referred to as KOP 1. KOP1 is situated on the farm access road, north of the project site. The sparse natural veldt result in general good visibility from this particular point. This creates a high visual sensitivity and potential intrusion of the proposed activity in the landscape. Despite the above, this observation point is some 3.11km away from the project site, which adds to the relative moderate visibility of the site. The home stead / visual receptor is identified as KOP 8. KOP8

represents the observation point closest to the project site, at some 1.95km. This observation point is therefore located in the middle ground of the project. Nevertheless, due to the relatively sparse natural vegetation on site, the viewer has an unobtrusive view of the project site. The visual impact on this observation point is therefore considered to be high and will be investigated further in the EIA phase.

This preliminary sensitivity analysis of the site should be considered by Klip Gat Solar Energy (Pty) Ltd in understanding which area of the site would be least impacted by the development of a PV solar energy facility in order to inform the preliminary infrastructure layouts for consideration within the EIA phase. Through the EIA phase more detailed studies will be conducted, and further sensitive areas will be marked, more accurately and in more detail than in this Draft Scoping Report.

6.2. Evaluation of the Potential Issues with Associated Infrastructure - Power Line, Invertors, Substation and Access Roads

In order to connect the Klip Gat solar energy facility to the power grid, the proposed facility is currently planning on connecting to the Linde/Carolus power line by a loop in and loop power line. Potential issues identified to be associated with a proposed overhead power line, substation, access roads and invertors include impacts on flora, fauna and ecological processes, impacts on avifauna as a result of collisions and electrocutions, potential impacts on heritage sites and visual impacts. The potential impacts associated with the power line, substation, access roads and inverters will be considered in detail within the EIA phase. Recommendations regarding preferred locations for this infrastructure and appropriate mitigation measures (if required) will be made.

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 7

This Draft Scoping Report includes a detailed description of the nature and extent of the proposed Klip Gat solar energy facility with details regarding the Scoping Phase, as well as the issues identified and evaluated through the Scoping Phase (to date). This chapter provides the context for a Plan of Study for the EIA.

The Plan of Study describes how the EIA Phase will proceed and includes details of the specialist studies required to be undertaken for those potential impacts recorded to be of potential significance. The key findings of the Scoping Phase includes inputs from authorities, the public, the proponent and the EIA specialist team and are used to inform the Plan of Study for EIA together with the requirements of the NEMA EIA Regulations of June 2010 and applicable guidelines.

7.1. Aims of the EIA Phase

The EIA Phase will aim 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 Klip Gat solar energy facility and associated infrastructure.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and will aim to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

7.2. Authority Consultation

Consultation with the regulating authorities (i.e. DEA and Northern Cape Department of Environmental and Nature Conservation (DENC)) has been undertaken and will continue throughout the EIA process. On-going consultation

and input from DEA and Northern Cape Department of Environmental and Nature Conservation (DENC) will include the following:

» Submission of a Final Scoping Report following a 30-day public review period of this draft scoping report (and consideration of comments received).
» Submission of a Final EIA Report following a 30-day public review period of the draft EIA Report.
» A consultation meeting and site visit with DEA and DENC in order to discuss the findings and conclusions of the EIA Report.

7.3. Consideration of Alternatives

The following project alternatives will be investigated in the EIA Phase:

» **The 'do nothing' alternative:** Klip Gat Solar Energy (Pty) Ltd does not establish the proposed PV Solar Energy Facility on Portion 2 of Farm Klip Gat 80.
» **Layout/design alternatives:** in terms of the design of the facility, particularly the layout of the PV panels and corridors/servitudes for associated infrastructure such as the access roads and power line/s.
» **Alternative technology combinations:** The facility is proposed to consist of Photovoltaic **(PV) panels** with an installed capacity of up to 75 MW.

7.4. Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

Based on the findings of the Draft Scoping Study, the following issues were identified as requiring further investigation within the EIA:

» There are Stone Age tools on the site, for further investigation by an archeologist.

Table 7.1: Issues requiring further investigation during the EIA Phase and activities to be undertaken in order to assess the significance of these potential impacts

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Ecology	Potentially significant impacts should be assessed during the EIA phase. The detailed methodology to be adopted in assessing the impacts is described in this section. » A site survey will be conducted at the appropriate time of the year in order to assess the vegetation that will be lost and/or disturbed. Special attention will be paid to the presence of Red Data species or potential habitat for them. Sensitive areas will be identified and mitigation measures will be included in the EMP » During the EIA phase declared weeds and alien invasive species already present in the area will be identified and the potential risks assessed. » The disturbance and/or direct loss of habitat at the proposed footprint and associated infrastructure areas will be quantified during the EIA phase. Sensitive areas or faunal species will be identified and mitigation measures recommended. » The impact of the construction of the proposed solar facility on the drainage system in the area will be assessed during the EIA phase. Sensitive areas will be identified and mitigation measures put in place to prevent/limit damage to the drainage system.	Dr Helga van der Merwe
Geology and soils	The following on-site assessments will be done during the EIA phase to verify the soils, land-use and geology on the site: » Land capability, current land-use and degradation status of the agricultural resources (i.e. soil and vegetation) » Geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, etc.) » Climate » Agriculturally sensitive areas or areas with high agricultural value (i.e. lands, wetlands and watercourses) » Agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, etc.) that will be impacted upon.	Louis George du Pisani of Edu Plan cc
Heritage – Archaeology and Desktop Palaeontology	An archaeologist will conduct a Phase 1 Archaeological Impact Assessment (AIA) in line with the requirements of the National Heritage Resource Act and will include:	Nkosinathi Tomose archaeologist of Zone

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» The identified and mapped sites need to be evaluated against predicted and potential project impacts and mitigation measures be developed to manage the sites during construction phase. » A desktop Palaeontology study has already been conducted as part of the scoping report, refer to Appendix I.	Land Solutions Job M. Kibii – Palaeontologist at the Institute for Human Evolution at the University of the Witwatersrand
Visual Impacts	**Assessment Process** The Klip Gat Solar Energy Facility will have a defined visual impact on its surroundings. In order to successfully determine the exact extent of this impact, the anticipated impact will be assessed during the EIA phase. In this regard, the proposed Plan of Study for EIA for the visual impact assessment is as follows: **1. Determine the distance/proximity of the respective observers from the proposed facility** The distance between the observer and the observed activity is an important determinant of the magnitude of the visual impact. This is due to the visual impact of an activity diminishing as the distance between the viewer and the activity increases. Viewsheds are categorised into three broad categories of significance, namely: a) Foreground: The foreground is defined as the area within 1km from the observer within which details such as colour, texture, styles, forms and structure can be recognised. Objects in this zone are highly visible unless obscured by other landscape features, existing structures or vegetation. b) Middle ground: The middle ground is the area between 1km and 3km from the observer where the type of detail which is clearly visible in the foreground becomes	Jacques Louis Volschenk of Zone land Solution

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	indistinguishable. Objects in the middle ground can be classified as visible to moderately visible, unless obscured by other elements within the landscape. c) Background: the background stretches from approximately 3km onwards. Background views are only distinguishable by colour and lines, while structures, textures, styles and forms are often not visible (SRK Consulting, 2007). **2. Determine the nature of the respective observation points** » Each observation point will be categorised according to its location and significance. Differentiation is made between tourist-related corridors, including linear geographical areas visible to users of a route or vantage points and residential areas (including farmsteads and townscapes). » The visual impact considered acceptable is dependent on the type of receptors. Visual rating between high (e.g. residential areas, nature reserves and scenic routes or trails), moderate (e.g. sporting or recreational areas, or places of work), or low sensitivity (e.g. industrial, mining or degraded areas) will be allocated to each observation point. **3. Determine the Visual Absorption Capacity of the environment** Visual absorption capacity (VAC) refers to the capacity of the receiving environment to absorb or screen the potential visual impact of the proposed activity. The VAC is primarily a function of the vegetation and will vary depending on the nature/density of the vegetation growth. The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. The VAC also generally increases with distance, where discernable detail in visual characteristics of both environment and structure decreases. The potential of the landscape to conceal the proposed activity will therefore be assessed in the EIA phase. A rating of *high* (effective screening by topography and vegetation), *moderate* (partial screening) and *low* (little screening) will be allocated to each observation point. **4. Determine the Visual Exposure**	

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Visual exposure is defined as *the relative visibility of a project or feature in the landscape*. This is often also referred to as the zone of visual influence which is *an area subject to the direct visual influence of a particular project.* » Exposure or visual impact tends to diminish exponentially with distance. A *high* (dominant or clearly visible), *moderate* (recognisable to the viewer) or *low* exposure (not particularly visible to the viewer) rating will be allocated to each observation point during the EIA phase. **5. Determine the visual intrusion of the proposed activity in the landscape** The potential of the activity to fit into the surrounding environment is a very important determinant. The visual intrusion relates to the context of the proposed activity while maintaining the integrity of the landscape. A rating of *high* (noticeable change), *moderate* (partially fits into the surroundings) or *low* (blends in well with the surroundings) will be allocated to each observation point during the EIA phase. In addition to the above, the cumulative visual impact of the proposed activity in the landscape should also be determined during the EIA phase. This phase should also be supplemented by appropriate mitigation measures to be employed to lessen the potential visual impact of the proposed activity on the respective observers.	
Social Impacts	The identification and assessment of social impacts will be guided by the Guidelines for specialist SIA input into EIAs adopted by DEA&DP in the Western Cape in 2007. The Guidelines are based on accepted international best practice guidelines, including the Guidelines and Principles for Social Impact Assessment (Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment, 1994). The approach will include: » Review of existing project information, including the Planning and Scoping Documents; » Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc.,);	Tony Barbour of Tony Barbour Consulting

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc; » Identification and assessment of the key social issues and opportunities; » Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented. » Finalisation SIA Report. As indicated above, the detailed public consultation process will be undertaken during the EIA phase of the project. The identification and assessment of social impacts will be guided by the Guidelines for specialist SIA input into EIAs adopted by DEA&DP in the Western Cape. These guidelines are based on international best practice for SIA's. This will include: » Identification of key interested and affected parties, specifically landowners; » Meetings and interviews with interested and affected parties; » Identification and assessment of key social issues based on feedback from key interested and affected parties. » Recommendations regarding mitigation/optimisation and management measures to be implemented as part of the EMP.	

7.5. Methodology for the Assessment of Potential Impacts

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  * Local extending only as far as the development site area – assigned a score of 1;
  * Limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  * Will have an impact on the region – assigned a score of 3;
  * Will have an impact on a national scale – assigned a score of 4; or
  * Will have an impact across international borders – assigned a score of 5.
» The **duration**, wherein it will be 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; or
  * 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); and
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be 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); and
  * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
» The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» The **status**, which will be described as *either positive, negative or neutral*.

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

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

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

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

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

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

As the developer has the responsibility to avoid and/or minimise impacts as well as plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed. Assessment of mitigated impacts will demonstrate the effectiveness of the proposed mitigation measures.

The results of the specialist studies and other available information will be integrated and synthesised by the Savannah Environmental project team. The EIA Report will be compiled, and will include:

» **Detailed description** of the proposed activity
» A description of the property(ies) on which the activity is to be undertaken and the location of the activity on the property(ies)
» A description of the **environment that may be affected by the activity** and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity
» Details of the **public participation process** conducted, including:
  * Steps undertaken in accordance with the plan of study for EIA;
  * A list of persons, organisations and Organs of State that were registered as interested and affected parties;

    - A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response to those comments; and
    - Copies of any representations, objections and comments received from registered interested and affected parties
- A description of the **need and desirability** of the proposed project and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity
- An indication of the methodology used in determining the **significance** of potential environmental impacts
- A description and comparative **assessment of all alternatives** identified during the environmental impact assessment process
- A summary of the findings and recommendations of **specialist reports**
- A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- An assessment of each identified potentially significant impact
- A description of any assumptions, uncertainties and gaps in knowledge
- an environmental **impact statement** which contains:
    - A summary of the key findings of the environmental impact assessment; and
    - A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- A draft **environmental management programme**
- Copies of specialist reports

The Draft EIA Report will be released for a 30-day public review period. The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the authorities for decision-making.

7.6. Public Participation Process

A public participation process will be undertaken by Savannah Environmental. Consultation with key stakeholders and I&APs will be on-going throughout the EIA Phase. Through this consultation process, stakeholders and I&APs will be encouraged to identify additional issues of concern or highlight positive aspects of the project, and to comment on the findings of the EIA Phase. In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities will be provided for stakeholders and I&APs to be involved in the EIA Phase of the process, as follows:

- Focus group or public meetings (pre-arranged and stakeholders invited to attend).

» One-on-one consultation meetings (for example with directly affected and 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 Draft EIA Report will be made available for public review for a 30-day period prior to finalisation and submission to the DEA for review and decision-making. In order to provide an overview of the findings of the EIA process and facilitate comments, a public meeting and key stakeholder workshop will be held during this public review period.

7.7. Key Milestones of the Programme for the EIA

The envisaged key milestones of the programme for the EIA Phase are outlined in the following table.

Key Milestone Activities	Proposed timeframe[7]
Public review period for Draft Scoping Report	August 2012 – September 2012
Finalisation of Scoping Report & submission to DEA	September 2012
Authority acceptance of the Final Scoping Report and Plan of Study to undertake the EIA	September 2012– October 2012
Undertake specialist studies and public participation process	October 2012
Make Draft EIA Report and Draft EMP available to the public, stakeholders and authorities	November 2012
Finalisation of EIA Report	December 2012
Submit Final EIA Report to DEA for review and decision-making	December 2012

[7] Indicative dates only

REFERENCES CHAPTER 8

References For Ecology Specialist Study

ACOCKS, J.P.H. 1953, 1988. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa 57: 1-146.

BRANCH, W.R. 1998. Field guide to the snakes and other reptiles of southern Africa. Struik Publishers, Cape Town.

BRANCH, B. 2008. Tortoises, terrapins & turtles of Africa. Struik Publishers, Cape Town.

BROMILOW, C. 2010. Probleemplante en Indringeronkruide van Suid-Afrika. Briza Publications, Pretoria.

CITES: FLORA. 2009. APPENDICES I, II & III

COURT, D. 2010. Succulent flora of southern Africa. Third revised edition. Struik Nature. Cape Town.

CARRUTHERS, V. 2001. Frogs and frogging in southern Africa. Struik Publishers, Cape Town.

DEAN, W.R. & MILTON, S.J. (Eds) 1999. The Karoo: Ecological patterns and processes. Cambridge University Press, Cambridge.

DRIVER, A., MAZE, K., ROUGET, M., LOMBARD, A.T., TURPIE, J.K., COWLING, R.M., DESMET, P., GOODMAN, P., HARRIS, J., JONAS, Z., REYERS, B., SINK, K. & STRAUSS, T. 2005. National Spatial Biodiversity Assessment 2004: Priorities for biodiversity conservation. Strelitzia 17: 1-45. South African National Biodiversity Institute, Pretoria.

ESLER, K., MILTON, S.J. & DEAN, R.J. 2006. Karoo veld – ecology and management. Briza Publications, Pretoria.

FRIEDMAN, Y. & DALY, B. (Eds). 2004. Red Data book of the mammals of South Africa: a conservation assessment. CBSG Southern Africa, Conservation Breeding

Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.

GERMISHUIZEN, G. & MEYER, N.L. (Eds). 2003. Plants of southern Africa: an annotated checklist. Strelitzia 14. National Botanical Institute, Pretoria.

GERMISHUIZEN, G., MEYER, N.L. STEENKAMP, Y. & KIETH, M. (Eds). 2006. A checklist of South African plants. SABONET Report no 41. Pretoria

GIBBS RUSSELL, G.E., WATSON, L., KOEKEMOER, M., SMOOK, L., BARKER, N.P., ANDERSON, H.M. & DALLWITZ, M.J. 1990. Grasses of southern Africa. Memoirs of the Botanical Survey of South Africa 58: 1 – 437.

GOLDING, J. (Ed.). 2002. Southern African Plant Red Data Lists. Southern African Botanical Diversity Network report no. 14. National Botanical Institute, Pretoria.

HARTMANN, H.E.K. 2002. Illustrated handbook of succulent plants. AIZOACEAE A-E. Springer-Verlag, Berlin.

HARTMANN, H.E.K. 2002. Illustrated handbook of succulent plants. AIZOACEAE F - Z. Springer-Verlag, Berlin.

HENDERSON, L. 2001. Alien weeds and invasive plants. Plant Protection Research Institute Handbook no. 12, Agricultural Research Council, Pretoria.

HILTON-TAYLOR, C. 1996a. Red Data list of southern African plants. Strelitzia 4: 1 - 117.

HILTON-TAYLOR, C. 1996b. Red Data list of southern African plants. 1. Corrections and additions. Bothalia 26: 177 - 182.

HILTON-TAYLOR, C. 1997. Red Data list of southern African plants. 2. Corrections and additions. Bothalia 27: 195 - 209.

HOCKEY, P.A.R, DEAN, W.R.J. & RYAN, P.G. (eds) 2006. Roberts birds of southern Africa. 7th edition. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

KELLERMAN, T.S., COETZER, J.A.W. & NAUDE, T.W. 1988. Plant poisonings and mycotoxicoses of livestock in southern Africa. Oxford University Press, Cape Town.

KLOPPER, R.R., CHATELAIN, C., BANNINGER, V., HABASHI, C., STEYN, H.M., DE WET, B.C., ARNOLD, T.H., GAUTIER, L., SMITH, G.F. & SPICHIGER, R. 2006. Checklist of the flowering plants of Sub-Saharan Africa. An index of accepted names and synonyms. SA Botanical Diversity Network No. 42. SABONET, SANBI, Pretoria.

LE ROUX, P.M., KOTZE, C.D., NEL, G.P. & GLEN, H.F. 1994. Bossieveld – grazing plants of the Karoo and karoo-like areas. Bulletin 428. Department of Agriculture, Pretoria.

LOW, A & REBELO, A. 1998. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs & Tourism, Pretoria.

MANNING, J. 2003. Wildflowers of South Africa. Briza, Pretoria.

MILLS, G & HES, L. 1997. The complete book of southern African mammals. Struik Winchester, Cape Town.

MUCINA, L., RUTHERFORD, M.C. & POWRIE, L.W. (eds). 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1 : 1 000 000 scale sheet maps. Pretoria: South African Biodiversity Institute.

MUCINA, L. & RUTHERFORD, M.C. (Eds). 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19: 1-807. South African National Biodiversity Institute, Pretoria.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT: BIODIVERSITY ACT (ACT NO 10 OF 2004). Government Gazette Vol. 467, No. 26436. 7 June 2004.

NATIONAL FORESTS ACT NO. 84 OF 1998. Government Gazette Vol 400. No. 19408. 30 October 1998.

NORTHERN CAPE NATURE CONSERVATION ACT (ACT NO. 9 OF 2009). Provincial Gazette Extraordinary, Vol 17, No. 1374, 21 January 2010. Kimberley.

RAIMONDO, D., VON STADEN, L., FODEN, W., VICTOR, J.E., HELME, N.A., TURNER, R.C., KAMUNDI, D.A. & MANYAMA, P.A. (Eds). 2009. Red lists of South African plants 2009. Strelitzia 25: 1-668. South African National Biodiversity Institute (SANBI), Pretoria.

ROBERTS, B.R. & FOURIE, J.H. 1975. Common grasses of the Northern Cape. Northern Cape Livestock Co-operative Limited, Vryburg.

RUTHERFORD, M.C. & WESTFALL, R.H. 1986. Biomes of southern Africa: an objective categorization. Memoirs of the Botanical Survey of South Africa 63. 2nd edition. National Botanical Institute, Pretoria.

SHEARING, D. & VAN HEERDEN, K. 1994. Karoo. South African wild flower guide 6. Botanical Society of South Africa. Cape Town.

SKINNER, J.D. & CHIMIMBA, C.T. 2005. The mammals of the southern African subregion. Cambridge University Press, Cambridge.

VAHRMEIJER, J. 1981. Gifplante van suider-Afrika wat veeverliese veroorsaak. Tafelberg Uitgewers, Kaapstad.

VAN DER MERWE, H. & VAN ROOYEN, G. 2011. Wild flowers of the Roggeveld and Tanqua. Published by Helga van der Merwe.

VAN JAARSVELD, E., VAN WYK, B-E & SMITH, G. 2000. Vetplante van Suid-Afrika. Tafelberg Uitgewers, Cape Town.

VAN OUDTSHOORN, F. 1999. Guide to grasses of southern Africa. Briza, Pretoria.

VAN RIET, W., CLAASSEN, P., VAN RENSBURG, J., VAN VIEGEN, T. & DU PLESSIS, L. 1997. Environmental Potential Atlas for South Africa (ENPAT). J.L. van Schaik Publishers, Pretoria.

VAN ROOYEN, N. 2001. Flowering plants of the Kalahari dunes. Ekotrust CC, Pretoria.

VAN WYK, A.E. & SMITH, G.F. 1998. Regions of Floristic Endemism in southern Africa. Umdaus Press, Pretoria.

VAN WYK, B-E. & SMITH, G. 1996. Guide to the Aloes of South Africa. Briza, Pretoria.

VAN WYK, B-E., VAN HEERDEN, F. & VAN OUDTSHOORN, B. 2002. Poisonous plants of South Africa. Briza, Pretoria.

VAN WYK, B-E, VAN OUDTSHOORN, B. & GERICKE, N. 1997. Medicinal plants of South Africa. Briza, Pretoria.

VAN WYK, B-E. & GERICKE, N. 2000. Peoples Plants. Briza, Pretoria.

VLOK, J. & SCHUTTE-VLOK, A. 2010. Plants of the Klein Karoo. Umdaus Press, Pretoria.

WEATHER BUREAU. 1988. Climate of South Africa. WB 40. Government Printer, Pretoria.

WEATHER BUREAU. 1998. Climate of South Africa. Government Printer, Pretoria.

WERGER, M.J.A. 1974. On concepts and techniques applied in the Zürich-Montpellier method of vegetation survey. Bothalia 11: 309-323.

WHITE, F. 1983. The vegetation of Africa. A descriptive memoir to accompany the UNESCO/AETFAT/UNSO vegetation map of Africa. UNESCO, Paris.

References For Soil Scoping Study

ACOCKS, J.P.H., 1988. Veld types of South Africa. Mem. of the Bot. Survey of SA. No. 57, Bot. Res. Inst., Dept. Agriculture & Water Supply, South Africa.

BOTHA, W. VAN D., 1998. Weidingskapasiteitstudies in die Karoo. Ph.D-dissertation, Univ. Of Free State. April 1998.

DEPARTMENT AGRICULTURAL DEVELOPMENT, 1991. Landbou-Ontwikkelings Program. Unpublished Report, Grootfontein Agric. Dev. Institute, Pbag X529, MIDDELBURG, 5900

DEPARTMENT AGRICULTURE, FORESTRY & FISHERIES, 2010. Regulations for the Evaluation and review of applications pertaining to wind farming on agricultural land. Unpublished report – November 2010.

JOHNSON, M.R. et. al. 2006. Sedimentary Rocks of the Karoo Supergroup. In: M.R. Johnson, et. al. (eds). The Geology of South Africa. Geological Society of South Africa.

LAND TYPE SURVEY STAFF, 1987. Land Types of South Africa. ARC-Institute for Soil, Climate & Water, Pretoria.

MACVICAR, C.N., et al. 1977. Soil Classification – A binomial system for South Africa. Res. Inst. for Soil & Irr., Dept. Agriculture Tech Services, South Africa.

MUCINA L. & RUTHERFORD M.C. (EDS) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

SCHULZE, B.R., 1980. Climate of South Africa – General Survey. Weather Bureau, Dept. Transport, South Africa.

VORSTER, M., 1985. *Die ordening van die landtipes in die Karoostreek in Redelik Homogene Boerderygebiede deur middel van plantegroei- en omgewings-faktore*. Ph.D.-dissertation, Potchefstroomse Universiteit vir CHO, May 1985.

References For Visual Impact Scoping Study

Noupoort.31°17''03.15' S and 24°55'12.14''E. Google Earth. 29 July 2012

Chief Director of Surveys and Mapping, varying dates.1:50 000 Topo-cadastral Maps and Data.

Dennis Moss Partnership (2010). Visual Impact Assessment for portions of the Farm Hartenbosch No. 217.

Department of Environmental Affairs and Development Planning. (2009). Provincial Spatial Development Framework. Western Cape Provincial Government, Cape Town

Department of Co-operative Governance, Human Settlements and Traditional Affairs (2012).Northern Cape Provincial Develo
pment and Resource Management Plan / Provincial Spatial Development Framework.

MetroGIS (Pty) Ltd. (2012). Proposed Middelburg Solar Park: Visual Impact Assessment

Mucina and Rutherford (2006). The vegetation map of South Africa, Lesotho and Swaziland. SANBI, Pretoria.

Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.

Rolston, H. (1994). Conserving natural value: Perspectives in biological diversity series. New York: Columbia University Press.

SRK Consulting. (2007). Visual Impact Assessment Report for the Proposed Sibaya Precinct Development. Report Prepared for Moreland (Pty) Ltd.

Umsobomvu Local Municipality. (2012/2013). Integrated Development Plan, Draft Document

http://www.saexplorer.co.za/south-africa/climate/noupoort_climate.asp

References For Heritage Scoping Study

Binneman,J.N.F; C. Booth & Higgitt,N. 2011. An Archaeological Desktop Study And Phase 1 archaeological Impact Assessment (Aia) for the Proposed Clidet Data Cable Between Bloemfontein, Orange Free State And Graaff Reinet, Eastern Cape Province; Colesberg, Orange Free State And Port Elizabeth, Eastern Cape Province; George,Western Cape Province And Port Elizabeth, Eastern Cape Province And; Aliwal North And East London, Eastern Cape Province.

Binneman, J.N.F; Booth, C & Higgitt, N. 2010c. A Phase 1 Archaeological Impact Assessment (AIA) for the proposed Dorper Wind Energy Facility on a site near Molteno, Chris Hani District Municipality, Eastern Cape Province.

Binneman, J., Webley, L. & Biggs, V. 1992. Preliminary notes on an Early Iron Age site in the Great Kei River Valley, Eastern Cape. Southern African Field Archaeology 1: 108-109.
Burman, J. 1984. Early Railways at the Cape, Cape Town: Human & Rousseau
Deacon, H.J. & Deacon, J. 1999. Human beginnings in South Africa. Cape Town: David Phillips Publishers.

Eastwood, E, J, van Schalkwyk and Smith, B. 2002 Archaeological and Rock Art Survey of the Makgabeng Plateau, Central Limpopo Basin. The Digging Stick. Volume 19 (No 1): 1-3.

Goodwin, A. J. H. 1926. The Victoria West Industry. In: Goodwin, A.J.H. & van Riet Lowe, C. (eds). The South African Cultures of South Africa. Annals of the South African Museum.

Goodwin, A.J.H. 1946. Earlier, Middle and Later. South African Archaeological Bulletin, 3 (1):74-76.
20

Goodwin, A.J.H. & Lowe, C. van Riet. 1929. The Stone Age cultures of South Africa. Annals of the South African Museum.

Hall, S & B.W. Smith, 2000. Empowering Places: Rock Shelters and Ritual control in the Farmer-Forager Interactions in the Limpopo Province [A Case of Saltpan Rock Shelter].
Humphreys, A. J. B. 1988. A Prehistoric Frontier in the Northern Cape and Western Orange Free State: Archaeological Evidence in Interaction and Ideological Change. Kronos Vol. 13:Pp. 3-13.

Huffman, T.N. 2007. Handbook for the Iron Age. Pietermaritzburg: UKZN Press.

Huffman, T. N. 1982. Archaeology and Ethnohistory of the African Iron Age. Annual review of Anthropology, 11:133-150.

Humphreys, A.J.B. 1991. On the distribution and dating of bifacial and tanged arrowheads in the interior of South Africa. The South African Archaeological Bulletin, 46(153):41-43.
Kleingeld, C. 2003. A South African Railway History. Accessed 14 December 2009.
Klatzow, S. 1994. Roosfontein, a contact site in the eastern Orange Free State. The South Africa Archaeological Bulletin, 49(159):9-15.

Klein, R. G. 1983. The Stone Age Prehistory of Southern Africa. Annual Review of Anthropology 12: 25-48.

Loubser, J; Brink, J & Laurens, G. 1990. Paintings of the extinct Blue Antelope, Hippotragus leucophaeus, in the Eastern Orange Free State. The South African archaeological Bulletin, 45(152):106-111.

Lycett, S.J. 2009. Are Victoria West cores "proto-Levallois"? A phylogenetic assessment. Journal of Human Evolution, Vol. 56:175-199.

Meintjes, J. 1969. Stormberg a Lost Opportunity. Nasionale Boekhandel.

Martin, D. 1988. Duelling with Long Toms: An Account of the 16th Battery Southern Division R.G. A during the Anglo-Boer War 1899-1902. In Memorium, Henry Powell, 1877-1958.

Malan, B.D. 1949. Mangosian and Howieson's Poort. The South African Archaeological Bulletin, 4(13):34-36.

Manhire, A. H; Parkington, J.E; Mazel, A.D & Maggs, T. M. 1986. Cattle, sheep and horses: A review of domestic animals in the rock art of southern Africa. South Africa Archaeological Society Goodwin Series, 5: 22-30.

Milton, J. 1983. The Edges of War. Cape Town: Juta & Co.

Morris, D. 1988. Engraved in place and time: a review of variability in the rock art of the Northern Cape and Karoo. South African Archaeological Bulletin, Vol. 43:109-121.

Nasson, B. 1999. The South African War 1899-1902. Arnold. A member of the Hodder Headline Group. London. Sydney. Auckland. Co-published in the United States of America by Oxford University Press Inx., New York.

Neville, D; Sampson, B.E & Sampson, C.G. 1994. The Frontier Wagon Track System in the Seacow River Valley, North-Eastern Cape. The South African Archaeological Bulletin, 49(160):65-72.

Ouzman, S. 2005. The magical arts of a raider nation: Central South Africa's Korana rock Art. South Africa Archaeological Society Goodwin Series 9:101-113.

Paxton, L, & D, Bourne. 1985. Locomotives of the South African Railways. C. Struik (Pty) Ltd.

Richardson, P & J. J. Van-Helten. 1980. The Gold Mining Industry in the Transvaal 1886-99. In Warwick, P., 1980, The South Africa War. Longman.

Sadr, K & Sampson, G. 1999. Khoekhoe ceramics of the upper Seacow Valley. South Africa Archaeological Bulletin, 54:3-15.

Sampson, C. G. 1984. Site clusters in the Smithfield settlement pattern. The South African Archaeological Bulletin, 39(139):5-23.

Sampson, C. G. 1985. Atlas of Stone Age Settlement in the Central and Upper Seacow Valley. Memoirs van die Nasionale Museum Bloemfontein, Vol. 20:1-116.

Sampson, C.G. 1988. Stylistic boundaries among mobile hunter-foragers. Washington: Smithsonian Institution Press.

Smith, R.A. 1919. Recent finds of the Stone Age in Africa. Man, 19:100-106.

Smith, A; Malherbe, C; Guenther, M and Berens, P. 2004. The Bushman of southern Africa: a foraging society in transition. Cape Town: David Philip Publishers:

SOUTH AFRICA,1983. Human Tissue Act. Government Gazette.
SOUTH AFRICA 1999. NATIONAL HERITAGE RESOURCES ACT (No 25 of 1999), Government Gazette. Cape Town..
SAHRA APMHOB. 2004. Policy for the management of Archaeology, Palaeontology, Meteorites and Heritage Object. . SAHRA: Cape Town.
SAHRA APM. 2006. Guidelines: Minimum standards for the archaeological and palaeontological Component of Impact Assessment Reports. . SAHRA: Cape Town.
SAHRA APMHOB 2002. General Introduction to surveys, impact assessments and management plans. . SAHRA: CT.
SAHRA. 2002. General guidelines to Archaeological Permitting Policy. SAHRA: Cape Town.
SAHRA. 2002. General Introduction to surveys, impact assessments and management plans.
SAHRA. What to do when Graves are uncovered accidentally.
Thackeray, A.I. 1983. Dating the Rock Art of Southern Africa. South Africa Archaeological Society Goodwin Series, 4:21-26.

Thompson, E. & Marean, C.W. 2008. The Mossel Bay lithic variant: 120 years of Middle Stone Age Research from Cape St. Blaize Cave to Pinnacle Point. South Africa Archaeological Society Goodwin Series, 10: 90-104.

Thorp, C.R. 1996. A preliminary report on evidence of interaction between hunter-gatherers and farmers along a hypothesised frontier in the eastern Free State. The South African Archaeological Bulletin, 51: 57-63.

Walton, J. 1953. An Early Fokeng-Hlakoana Settlement at Metlaeeng, Basutoland. The South African Archaeological Bulletin, 8 (29): 3-11.

Woodhouse, H.C. 1984. [Correction:] Lion kills: A previously unidentified theme in the Bushman Art of Southern Africa. The South Africa Archaeological Bulletin, 39(139):4.

INTERNET SOURCES:

http://www.boer.co.za/boerwar/hellkamp.htm
http://www.lib.uct.ac.za/mss/bccd/histories/Balmoral/
http://www.boervyheid.co.za/platform/showthread.php?
http://www.safrica.info/doing_business/economy/key_sectors/transport.htm
http://www.transnet.co.za
http://myfundi.co.za/e/South_African_Railways_I:_Ownership_through_the_years"
http://en.wikipedia.org/wiki/Cape_Government_Railways#CITEREFBurman1984
http://www.wildebeestkuil.itgo.com/
http://www.openafrica.org/route/Seraki-Blouberg-Route

References For Paleontological Impact Assessment

Anderson, J.M. and Anderson, H.M. (1985). Palaeoflora of Southern Africa. Prodromus of South African Megafloras, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam, pp 423.

Broom, R. (1906). The classification of the Karoo Beds of South Africa. Geol. Mag., New Ser., Decade (5) 3, 36

Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J. (Eds.) (2006). The Geology of South Africa. Geological Society of South Africa, Johannesburg/Coucil for Geoscience, Pretoria, 691 pp.

Rubidge, B.S., Johnson, M.R., Kitching, J.W., Smith, R.M.H., Keyser, A.W. and Groenewald, G.H. (1995). An introduction to the biozonation of the Beaufort Group. In: Rubidge, B.S. (Ed.), Biostratigraphy of the Beaufort Group (Karoo Supergroup). Biostrat. Ser. S. Afr. Comm. Strat., 1, 1-2.

Smith, R., Rubidge, B.S. and van der Walt, M. (2012). Therapsid Biodiversity Patterns and Palaeoenvironments of the Karoo basin, South Africa. In: Chinsamy, T.A (ed) Forerunners of Mammals. Indiana University Press.

References For Social Impact Scoping Study

Emthanjeni Local Municipality Integrated Development Plan 2010.
Integrated Resource Plan (IRP) for South Africa (2010-2030);
Northern Cape Provincial Growth and Development Strategy (2004-2014)
Pixley ka Seme District Municipality Integrated Development Plan 2009-2012; and
StatsSA Community Survey, 2007;
The National Energy Act, 2008;
The White Paper on Renewable Energy, November 2003; and
The White Paper on the Energy Policy of the Republic of South Africa, December 1998.

Internet sources

- www.demarcation.org.za (Census 2001 data)