ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
FINAL SCOPING REPORT

PROPOSED GROOTKOP SOLAR ENERGY FACILITY NEAR ALLANRIDGE, FREE STATE PROVINCE
(DEA Ref No: 14/12/16/3/3/2/515)

FINAL SCOPING REPORT FOR THE SUBMISSION TO THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/515
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PURPOSE OF THE FINAL SCOPING REPORT

FRV Energy South Africa (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with a export capacity of up to 75MW, as well as associated infrastructure on a site located approximately 9 km south-east of Allanridge, Free State Province. Based on a pre-feasibility analysis, site identification and environmental screening process undertaken by FRV, a favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA).

The proposed development requires a development area of approximately 240 ha, and is to be located within a broader site of approximately 450 ha. Therefore the facility can be appropriately placed within the broader site such that any identified environmental sensitivities can be avoided. The proposed facility is envisaged to have a maximum export capacity of 75 MW to be achieved through several arrays of PV panels and the following associated infrastructure:

- Mounting structures for the solar panels to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
- Cabling between project components, to be lain underground where practical.
- A new on-site substation to evacuate the power from the facility into the Eskom grid (loop in loop out connection to the 132kv line on the farm and this connects to the Grootkop 132/44/11 kV substation)
- Internal access roads and fencing.
- Workshop area for maintenance, storage, and offices.

This Final Scoping Report represents the outcome of the Scoping Phase of the EIA process and contains the following sections:

- **Chapter 1** provides background to the project and the environmental impact assessment
- **Chapter 2** provides an overview of the project, describes solar energy as a power option and describes the activities associated with the project (project scope)
- **Chapter 3** outlines the process followed during the Scoping phase of the project
- **Chapter 4** describes the existing biophysical and socio-economic environment
- **Chapter 5** provides an evaluation of the potential issues associated with the proposed project
- **Chapter 6** presents the conclusions of the scoping study
- **Chapter 7** describes the Plan of Study for EIA
- **Chapter 8** contains a list references for the scoping report and specialist reports

The Scoping Phase of the EIA process identifies potential issues associated with the proposed project, and defines the extent of the studies required within the EIA Phase. The EIA Phase will address those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts.

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

INVITATION TO COMMENT ON THE DRAFT SCOPING REPORT

Members of the public, local communities and stakeholders were invited to comment on the Draft Scoping Report which was made available for public review and comment from **24 May 2013 - 24 June 2013**:

» Welkom Public Library
» Odendaalsrus Library
» www.savannahSA.com

Comments were received through written submission via fax, post or e-mail. I&APs were also informed in writing that this Final Scoping Report has been prepared and submitted to DEA and is available for comment and for download from the website: www.savannahSA.com. Copies of the Final EIA report could be requested, if desired or required by I&APs from the consultant.

SUMMARY

Background and Project Overview

FRV Energy South Africa (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with a export capacity of up to 75MW, as well as associated infrastructure on a site located approximately 9 km south-east of Allanridge, Free State Province (refer to figure 1.1). Based on a pre-feasibility analysis, site identification and environmental screening process undertaken by FRV Energy South Africa (Pty) Ltd, a favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA).

The Grootkop Solar Energy Facility is proposed to be located on farm Hilton 30, about 9 km south-east of Allanridge, within the Matjhabeng Local Municipality of the Free State Province. A broader area of approximately 450 ha is being considered within which the facility is to be constructed. The proposed facility is envisaged to have a maximum export capacity of 75 MW to be achieved through several arrays of PV panels and the following associated infrastructure:

» Mounting structures for the solar panels 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.
» A new on-site substation to evacuate the power from the facility into the Eskom grid (loop in loop out connection to the 132kv line on the farm and this connects to the Grootkop 132/44/11 kV substation)
» Internal access roads and fencing.
» Workshop area for maintenance, storage, and offices.

The proposed development requires a development area of approximately 240 ha, and is to be located within a broader site of approximately 450 ha. Therefore the facility can be appropriately placed within the broader site such that any identified environmental sensitivities can be avoided.

This Final 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 that included both 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.

Environmental Impact Assessment

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GN R543 (Regulations 26-35) and R545, a Scoping Study and EIA are required to be undertaken for this proposed project.

The scoping phase for the proposed project forms part of the EIA process and has been undertaken in accordance with the EIA Regulations.

This **Final Scoping Report** aimed to identify and describe potential environmental impacts associated with the proposed project and to define the extent of the specialist studies required within the EIA process. This was achieved through an evaluation of the proposed project involving specialists (with expertise relevant to the nature of the project and the study area), the project proponent, as well as a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs).

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 and 2 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 1.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Grootkop Solar Energy Facility

Construction / Decommissioning Impacts	Extent
Disturbance to and loss of indigenous natural vegetation	L
Disturbance or loss of threatened / protected plants	L
Loss of habitat for threatened and /or protected vertebrates	L
Impacts on wetlands	L
Establishment and spread of declared weeds and alien invader plants	
Land surface disturbance and alteration	L
Loss of topsoil	L
Placement of spoil material	L
Loss of wetland vegetation and habitat	L
Soil Compaction	L
Deterioration of water quality	L - R
Destruction of palaeontological landscape	L
Destruction of stone age finds: ESA, MSA, LSA,	L
Destruction of iron Age finds: EIA, MIA and LIA	L
Destruction of historical finds: periods, dumps, remains and cultural landscape	L
Destruction of living heritage i.e. rainmaking sites	L
Destruction of burial/cemeteries: over 100 and younger than 60 years	L
Damage or destruction of fossil materials	L
Damage or destruction due to movement of fossil materials	L
Loss of access for scientific study to any fossil materials	L
Potential visual impacts associated with the construction phase on observers in close proximity to the facility.	L
The potential visual impact of the construction of ancillary infrastructure (i.e. the substation at the facility, associated power line and access roads) on observers in close proximity of the facility.	L
Potential impact on rural sense of place	L - R
Potential impact on farming activities and other existing land uses	L - R
Potential impact on property prices, specifically adjacent properties	L - R

Potential impacts associated with the presence of construction workers	L - R
Creation of employment and business opportunities	R - N
Creation of potential training and skills development opportunities for local communities and businesses	L - R

Table 1.2: Potential impacts associated with the Operational Phase with all three phases of the proposed Grootkop Solar Energy Facility

Operational Impacts	Extent
Disturbance or loss of indigenous natural vegetation due to shading	L
Altered runoff patterns due to rainfall interception by PV panels and compacted areas	L - R
Loss of agricultural potential	L -R
Long term loss of arable land and potential soil erosion.	L -R
Erosion	L
Deterioration of water quality	L - R
Increase in the occurrence of alien invasive vegetation within the wetlands	L
Indirect impacts on heritage resources	L
Impacts on cultural landscape and sense of place	L - R
Bird mortality due to power line collision and electrocutions	L - R
Visual exposure to solar panels and associated infrastructure	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**

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DEFINITIONS AND TERMINOLOGY

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

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Article 3.1 (*sensu* Ramsar Convention on Wetlands): "Contracting Parties "shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory"".(Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see http://www.ramsar.org/)

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

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

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

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

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

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

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

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

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

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

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

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

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

Interested and Affected Party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local

communities, investors, work force, consumers, environmental interest groups and the general public.

Natural properties of an ecosystem (*sensu* Convention on Wetlands): Defined in Handbook 1 as the "…physical, biological or chemical components, such as soil, water, plants, animals and nutrients, and the interactions between them". (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see http://www.ramsar.org/)

Ramsar Convention on Wetlands: "The Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". As of March 2004, 138 nations have joined the Convention as Contracting Parties, and more than 1300 wetlands around the world, covering almost 120 million hectares, have been designated for inclusion in the Ramsar List of Wetlands of International Importance." (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (refer http://www.ramsar.org/). South Africa is a Contracting Party to the Convention.

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

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

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

Sustainable Utilisation (*sensu* Convention on Wetlands): Defined in Handbook 1 as the "human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs

and aspirations of future generations". (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (refer http://www.ramsar.org/).

Wise Use (*sensu* Convention on Wetlands): Defined in Handbook 1 (citing the third meeting of the Conference of Contracting Parties (Regina, Canada, 27 May to 5 June 1987) as "the wise use of wetlands is their sustainable utilisation for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem".(Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see http://www.ramsar.org/)

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBOs	Community Based Organisations
CDM	Clean Development Mechanism
CSIR	Council for Scientific and Industrial Research
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DEDEA	Free State Department of Economic Development, Tourism and Environmental Affairs
DEAT	National Department of Environmental Affairs and Tourism
DEA	National Department of Environmental Affairs
DME	Department of Minerals and Energy
DOT	Department of Transport
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEP	Integrated Energy Planning
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework
SIA	Social Impact Assessment
ZVI	Zone of visual influence

INTRODUCTION CHAPTER 1

FRV Energy South Africa (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with an export capacity of up to 75MW, as well as associated infrastructure on a site located approximately 9 km south-east of Allanridge, Free State Province (refer to figure 1.1). This project is to be known as the **Grootkop Solar Facility**. Based on a pre-feasibility analysis, site identification and environmental screening process undertaken by FRV Energy South Africa (Pty) Ltd, a favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA).

Globally there is an increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources. South Africa currently depends on fossil fuels for the supply of approximately 90% of its primary energy needs. With economic development over the next several decades resulting in an ever increasing demand for energy, there is some uncertainty as to the availability of economically extractable coal reserves for future use. Furthermore, several of South Africa's power stations are nearing the end of their economic life, require refurbishment, or have been recently returned to service (re-commissioned) at great expense (i.e. the Camden, Komati, and Grootvlei Power Stations).

This, together with the current electricity imbalances in South Africa highlight the significant role that renewable energy can play in terms of power supplementation. Given that renewables can generally be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses. At present, South Africa is some way off from exploiting the diverse gains from renewable energy and from achieving a considerable market share in the industry.

In order to meet the long-term goal of a sustainable renewable energy industry, a target of 17.8 GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010 and incorporated in the Renewable Energy Independent Power Procurement Programme (REIPPP). The energy procured through this programme 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 17,8GW of power from renewable energy amounts to ~42% of all new power generation being derived from renewable energy forms by 2030. It is the intention of FRV Energy South Africa that the proposed Grootkop Solar Facility will contribute towards this goal for renewable energy.

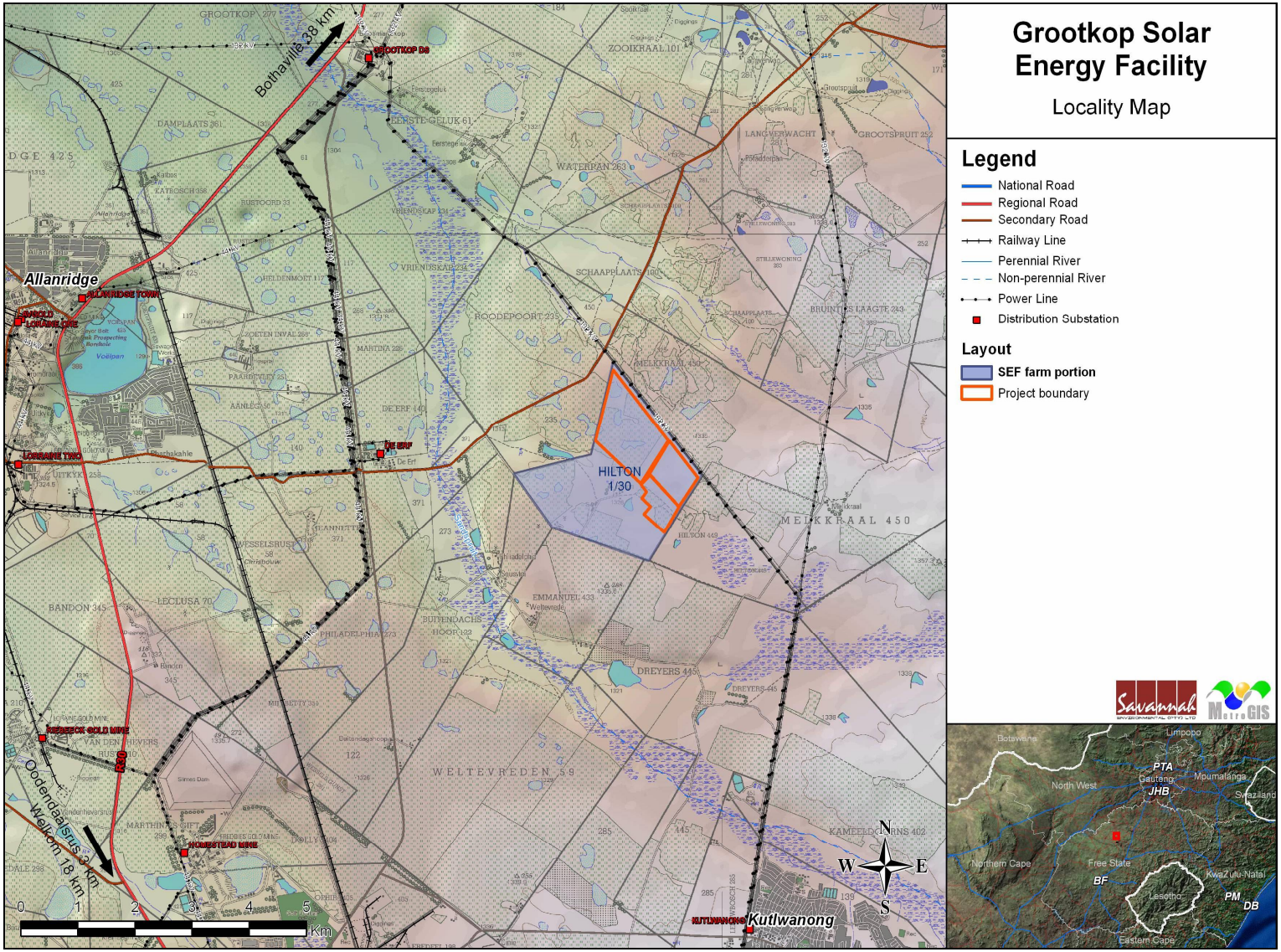

Figure 1.1: Locality Map for the Proposed Grootkop Solar Energy Facility

The purpose of the proposed Grootkop Solar PV project is to sell the electricity generated to Eskom as part of the REIPPP. The REIPPP has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities by IPPs. Selling of electricity according to the IPP Procurement Programme has the advantage of giving developers long-term stability and predictability, as well as providing the opportunity for the South African Government to introduce renewable energy into the power generation technology mix within the country, as per the aims of the IRP for the period 2010 – 2030.

FRV Energy South Africa (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, FRV Energy South Africa (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 the power purchase agreement period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

The overarching objective for the proposed PV facility is to maximise electricity production through exposure to solar irradiation, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. In this regard local level environmental and planning issues will be assessed through the Environmental Impact Assessment (EIA) process in order to identify, and assess areas of sensitivity within the broader site. This will serve to inform the design/layout of the facility in order to meet these objectives.

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

1.1. Summary of the Proposed Development

The Grootkop Solar Energy Facility is proposed to be located on farm Hilton 30, about 9 km south-east of Allanridge, within the Matjhabeng Local Municipality of the Free State Province. A broader area of approximately 450 ha is being considered within which the facility is to be constructed. The proposed facility is envisaged to have a maximum export capacity of 75 MW to be achieved through the installation of several arrays of PV panels and the following associated infrastructure:

» Mounting structures for the solar panels to be either rammed steel piles, or piles with pre-manufactured concrete footings to support the PV panels.

» Cabling between the structures, to be lain underground where practical.
» A new on-site substation to evacuate the power from the facility into the Eskom grid
» A loop in loop out power line connection to the 132kV power line which traverses the farm, which in turn connects to the Grootkop 132/44/11 kV substation.
» Internal access roads and fencing.
» Associated buildings including a workshop area for maintenance and storage, and offices.

The proposed development requires a development area of approximately 240 ha, and is to be located within the broader study area of ~450 ha. Therefore the facility can be appropriately placed within the broader site such that any identified environmental sensitivities and technical constraints can be avoided.

From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual direct solar irradiation values. From a local perspective, the site is preferred due to its suitable topography (i.e. in terms of slope and local topography), proximity to a grid connection point (i.e. for the purpose of electricity evacuation), site access (i.e. to facilitate the movement of machinery during the construction phase), land availability, and by virtue of the extent of the site enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints.

The nature and extent of the proposed facility, and the potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this Scoping Report. This Scoping Report consists of the following sections:

» **Chapter 1** provides background to the proposed project and the environmental impact assessment process.
» **Chapter 2** describes the activities associated with the project (project scope). This chapter also describes solar energy as a power generation option and provides insight to technologies for solar PV.
» **Chapter 3** outlines the process which has been followed to date during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties.
» **Chapter 4** describes the existing biophysical and social environment.
» **Chapter 5** provides an evaluation of the potential issues associated with the proposed project and outlines gaps in knowledge and requirements for further investigation.
» **Chapter 6** presents the conclusions of the scoping evaluation.
» **Chapter 7** describes the Plan of Study for EIA.

» **Chapter 8** provides references used to compile the Scoping Report.

1.2. Requirement for an Environmental Impact Assessment Process

The proposed PV facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 107 of 1998. 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 mandated 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 Free State Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) will act as a commenting authority. An application for authorisation has been accepted by DEA for the proposed project under application reference number **14/12/16/3/3/2/515.**

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543; GNR544; GNR545; and GNR546, the following 'listed activities' are triggered by the proposed PV facility:

Relevant Notice	Activity No.	Description of Listed Activity	Relevant Component(s) of Facility
GN544, 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 33 but less than 275 kilovolts.	*The construction of a 132kV overhead power line from the solar facility to the Eskom electricity grid*
GN544, 18 June 2010	11	The construction of vi) bulk storm water outlet structures; and (xi)..infrastructure or structures covering 50 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.	*The construction of the proposed solar facility may impede on drainage lines on the site due to infrastructure such as storm water structures and access roads.*
GN544, 18	13	The construction of facilities or	*The facility may require*

Relevant Notice	Activity No.	Description of Listed Activity	Relevant Component(s) of Facility
June 2010		infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.	*the storage and handling of dangerous goods such as fuels, oil or chemicals.*
GN544, 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 water course	*The proposed activity might require the infilling and deposition of materials within watercourses. The applicability of this activity will be confirmed through the EIA process.*
GN544, 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.~~	*Access roads will be required to the site and within the site.*
GN 544, 18 June 2010	26	Any process or activity identified in terms of section 53 (1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (i) Impacts on orange or red data plant species may be a process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	*The applicability of this activity will be confirmed during the EIA Phase.*
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 export capacity of up to 75MW.*
GN545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for	*The PV facility will have a developmental footprint of*

Relevant Notice	Activity No.	Description of Listed Activity	Relevant Component(s) of Facility
		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:~~ ~~(ii) Linear development activities.~~ (iii) ~~Agriculture or afforestation where activity 16 in this schedule will apply.~~	*more than 20 ha.*
GN546, 18 June 2010	14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, (i) All areas outside urban area	*The project will be taking place outside urban areas and 75% or more of the vegetative cover constitutes natural vegetation.*

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:

» *Scoping Phase* - 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 to be identified and delineated in order to define any environmentally 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.

» *EIA Phase* – includes a detailed assessment of potentially significant positive and negative environmental impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase includes detailed specialist investigations and further 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 (EMPr) (including recommendations for practical and achievable mitigation and management measures) to DEA for consideration and decision-making.

An EIA is an effective planning and decision-making tool for the project developer as it provides the opportunity for the developer to be fore-warned of potential environmental issues 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.

1.3. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was appointed by FRV Energy South Africa (Pty) Ltd as the independent environmental consultant to undertake both Scoping and EIA processes for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to FRV Energy South Africa (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 from renewable energy, including wind and solar resources. The team from Savannah Environmental includes:

- **Jo-Anne Thomas**, the principle Environmental Assessment Practitioner (EAP) for this project, is a registered Professional Natural Scientist and holds a Master of Science degree. She has 14 year's experience consulting in the environmental field with a. 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 involved in undertaking siting processes as well as EIAs for several renewable energy projects across the country.
- **Lusani Rathanya** - the principle author of this report holds an Honours Bachelor degree in Environmental Management and Analysis. Her key focus is on environmental impact assessments, waste and water licences, environmental management plans and programmes, as well as compiling

proposals and budget for variety of environmental projects. She is currently involved in several EIAs for renewable energy projects EIAs across the country.

» **Gabriele Wood:** the public participation consultant for this project, hold an Honours Bachelor degree in Anthropology and has 5 years' experience in Public Participation and Social consultancy including professional execution of public participation consulting for a variety of projects as well as managing and coordinating public participation processes for Environmental Impact Assessments (EIA).

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

» Ecology – Marianne Strohbach (Savannah Environmental)
» Soils and Agricultural Potential – Johann Lanz (Johann Lanz Consulting)
» Wetland – Bhuti Dlamini (Wetland Consulting Services (Pty) Ltd)
» Heritage and Desktop Palaeontological Assessment – Jaco van der Walt (Heritage Contracts and Archaeological Consulting CC)
» Visual – Lourens du Plessis (MetroGIS)
» Social – Tony Barbour (Tony Barbour Environmental Consultancy)

Refer to Appendix A for the curricula vitae for Savannah Environmental and specialists.

OVERVIEW OF THE PROPOSED PROJECT CHAPTER 2

This chapter of the scoping report provides an overview of the proposed PV facility and 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.

2.1. Location and Project Components

The Grootkop Solar Energy Facility is proposed to be located on farm Hilton 30, about
9 km south-east of Allanridge, within the Matjhabeng Local Municipality of the Free State Province. The proposed facility is envisaged to have a maximum export capacity of 75 MW to be achieved through several arrays of PV panels and the following associated infrastructure:

The following table details the project components.

Table 2.1: Project infrastructure

Component	Description
Location of the site	~9 km south-east of Allanridge
Municipal Jurisdiction	Matjhabeng Local Municipality of the Free State Province
Extent of the proposed development	240 ha
Extent of broader site	450 ha
Site access	Gravel road from the R30
Export capacity	75MW
Proposed technology	Photovoltaic panels (either fixed or tracking)
Associated infrastructure	» Mounting structures for the solar panels to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels. » Cabling between the structures, to be lain underground where practical. » A new on-site substation to evacuate the power from the facility into the Eskom grid. » A loop in loop out power line connection to the 132kV line which passes parallel to the farm, which in turn connects to the Grootkop substation. » Internal access roads and fencing. » Associated buildings including a workshop area for maintenance, storage, and

Component	Description
	offices.

Table 2.2: Dimensions of typical structures required for the PV Facility

Infrastructure	Dimensions/ Details
Technology	Static or tracking panels
Construction lay down area (temporary)	100m x 100m
Number of panels	352 x 250W
Height of panels	up to 4m
On-site substation	20m x 5m
Transformer	Height of the PV box (inverter +transformer): 40' feet container: • Length 2,025m • Width 2,352m • Height 2,393m
Other Infrastructures	• Maintenance building: 20m x 5m (2,5 m high) • Warehouse: 20mx10m (4m high) • Fence height: 2,5 m
Internal Access Roads	4 – 6 m wide roads will be constructed but will keep to existing roads as far as possible

2.1.1. Water Usage Associated With the Solar Energy Facility

The Grootkop Solar Energy Facility will require the use of water during its construction and to a lesser extent, the operation phase. The water requirement for the project are approximately 1 915 000m^3 for the construction phase over 12 – 18 months and 3 144m^3 of water per year for the operational phase over the 20 year lifetime of the project for the cleaning of panels, i.e. removal of dust onto the panels. FRV Energy South Africa will apply for a water use licence from the Department of Water Affairs to abstract groundwater from the site as a primary source of water for the project. FRV Energy South Africa will contract a registered company/ies to collect the general, hazardous and liquid (sewerage) waste from site and dispose safely at licensed disposal or treatment facility.

2.2. Project Alternatives

In accordance with the requirements of the EIA Regulations[1], alternatives are required to be considered within the EIA process, and may refer to any of the following:

» Site alternatives
» Design or layout alternatives

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

» Technology alternatives
» No-go alternative

2.2.1. Site Alternative

Due to the nature of the development (i.e. a renewable energy facility), the location of the project is largely dependent on technical factors such as solar irradiation (i.e. the fuel source), climatic conditions, extent and topography of the site and available grid connection. The proposed site was identified by the proposed developer as being technically feasible. No feasible site alternatives within the broader area were identified for this specific project by the project developer.

The following characteristics were considered in determining the feasibility of the proposed site:

Site Extent - space is a restraining factor for the development of a PV facility. An area of approximately 240 ha would be required for a facility of up to 75 MW export capacity. The proposed site, which is approximately 450 ha in extent, will therefore be sufficient for the installation of the proposed facility, and should allow for the avoidance of any identified environmental and/or technical constraints in terms of the final design of the facility.

Land availability and Site access - The land is available for lease by the developer. Access to the proposed development area is afforded by a secondary (local) road that joins the R30 at Odendaalsrus, to the south, or the R30 near Allanridge to the north. The site is therefore appropriately located for easy transport of components and equipment as well as labour movement to and from the site.

Climatic Conditions - the economic viability of a PV facility is directly dependent on the annual direct solar irradiation values. The site has been indicated as an area of high irradiation, which indicates that the regional location of the project is appropriate for a solar energy facility.

Gradient - a level surface area is preferred for the installation of PV panels. The slope of the proposed site is considered to be acceptable from a development perspective, which reduces the need for extensive earthworks and associated levelling activities, thereby minimising environmental impacts.

Grid Connection – The proposed site is located immediately south-west of the *Anglo Geduld-Grootkop 132kV* and *Grootkop-Leander 132kV* power lines. The electricity generated by the facility is expected to be evacuated into one of these lines using a loop-in/loop-out connection. Through the construction of a loop-in

loop-out connection power line, the electricity generated at the PV facility could be evacuated from the proposed on-site substation directly into the grid without the need for construction of power lines outside the boundaries of the property.

Environmental sensitivity – establishment of a PV facility requires a large amount of land which may result in adverse impacts on the environment. Through a brief ecological screening study undertaken no significant ecological flaws that could pose a problem to the proposed PV development were observed. The proposed area has wetland.

2.2.2. Layout Design Alternatives

As indicated above, the proposed Grootkop PV facility is expected to have a developmental footprint (~240ha) which is smaller than the broader farm (~450ha). Therefore the facility and associated infrastructure (i.e. PV panels, internal roads, etc.) can be appropriately located to avoid sensitive areas within the broader study area. The extent of the site therefore allows for the identification of design layout and siting alternatives within the site boundaries.

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 the internal 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. Feasible design alternatives will be assessed within the EIA phase of the process.

2.2.3 Technology Alternatives

As it is the intention of FRV Energy South Africa to develop renewable energy projects as part of the DoE's REIPPP, only renewable energy technologies are being considered. Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability (i.e. solar irradiation). Solar PV was determined as the most suitable option for the proposed site as large volumes of water are not needed for power generation purposes compared to concentrated solar power technology (CSP). PV is also preferred when compared to CSP technology because of the lower visual profile.

Very few technological options exist as far as PV technologies are concerned; those that are available are usually differentiated by weather and temperature

conditions that prevail – so that optimality is obtained by the final choice. The impacts of any of the PV technology choices on the environment are very similar. The construction, operation and decommissioning activities associated with the facility will also be the same irrespective of the technology chosen. There are a number of different solar PV technologies, i.e.:

» Fixed / static PV panels;
» Tracking PV panels (with solar panels that rotate to follow the sun's movement); and
» Concentrated PV Plants (CPV technology).

Fixed or tracking PV is being considered for the proposed Grootkop PV Facility. The preferred option will be informed by financial, technical and environmental factors.

Fixed Mounted PV System (Preferred Alternative)

In a fixed mounted PV system, PV panels are installed at a pre-determined angle from which they will not move during the lifetime of the plant's operation. The limitations imposed on this system due to its static placement are offset by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of PV panels has been shown to only marginally affect the efficiency of energy collection. There are further advantages which are gained from fixed mounted systems, including:

» The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that these PV mountings include moving parts.
» Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems.
» Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.

Dual Axis Tracking System

In a dual axis tracking system, PV panels are fixed to mountings which track the sun's movement. There are various tracking systems. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking systems are a new

technology and, as such, are less suitable to operations in South Africa. This is because:

» A high degree of maintenance is required due to the nature of the machinery used in the system, which consists of numerous components and moving parts. A qualified technician is required to carry out regular servicing of these parts, which places a question on the feasibility of this system given the remote location of the proposed project site.
» The costs of the system are necessarily higher than a fixed mounted system due to the maintenance required for its upkeep and its complex design.
» A larger project site is required for this system given that the separate mountings need to be placed a distance apart to allow for their tracking movement.
» A power source is needed to mechanically drive the tracking system and this would offset a certain portion of the net energy produced by the plant

2.2.4. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Grootkop Solar Energy Facility. Should this alternative be selected then there will be impacts at a local and 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 potential benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the proposed facility is only proposed to contribute 75MW to the grid capacity, this would assist in meeting the growing electricity demand throughout the country and would also assist in augmenting government's renewable energy goals.

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.

The do nothing alternative will be assessed within the EIA phase of the process.

2.3. Photovoltaic Technology and the Generation of Electricity

Solar energy facilities convert solar energy to a useful form, such as electricity. Solar energy facilities produce an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as do fossil fuel power generation technologies.

Globally, the solar PV market grew by 110% in 2008. Although South Africa has high levels of irradiation and could achieve between 4.5 kWh/m^2 and 6.55 kWh/m^2 from a solar PV panel, the installed capacity country-wide is currently only 12 MW, although there are a number of facilities currently under construction as part of the DoE REIPPP.

Solar energy facilities, such as those using PV technology use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. This is achieved using the following components:

- ***Photovoltaic Cells:*** An individual photovoltaic cell is made of silicone which acts as a semiconductor (refer to Figure 2.3. 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 (refer to Figure 2.3).

Figure 2.1: Figures showing a typical PV cell and an array of PV panels, where each panel is generally up to 2 - 4 m high.

» ***Support Structure:*** In fixed mounted PV systems, the PV panels will be fixed to a support structure which will allow for them to be set at an angle so to receive the maximum amount of solar radiation. The angle of the panels is dependent on the latitude of the proposed facility and may be adjusted to optimise for summer or winter solar radiation characteristics. The height of the PV arrays is expected to be up to 4 m.

In a dual axis tracking system, PV panels are fixed to mountings which track the sun's movement. There are various tracking systems. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. When the tracking panel is vertical the structure may be up to a maximum height of approximately 4m.

Figure 2.2: The support structures elevate the panels and allow for dual axis tracking of the sun for increased efficiency (Source: Gigaom)

2.4. Overview of the Construction Phase

In order to construct the proposed project, a series of activities will need to be undertaken. The construction process is discussed in more detail below.

2.4.1. 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 confirmation of the micro-siting footprint, and survey of the substation site and road servitudes.

2.4.2. Establishment of Access Roads to the Site

Access to the site (directly from the R30 via a gravel road) will be required. The existing access to the farm from this road is considered adequate and will be utilised. 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 need to be constructed. 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.

2.4.3. Undertake Site Preparation

Site preparation activities will include clearance of vegetation within the footprint of the PV arrays as well as within the footprint of other facility infrastructure. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

2.4.4. 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 then proposed internal access road. Some of the components (e.g. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of

1989)[2] by virtue of the dimensional limitations (i.e. weight). Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.).

2.4.5. Establishment of Laydown Areas on Site

Laydown and storage areas will be required for the typical construction equipment which will be required on site. The laydown area is proposed to be up to 100m x 100m in extent.

2.4.6. 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 4 m.

Figure 2.3: Frame, structural details (Courtesy of Igeam, 2011)

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

Figure 2.4 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 proposed 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.

2.4.7. Construct On-site substation and Power line

The proposed site is located immediately south-west of the *Anglo Geduld-Grootkop 132kV* and *Grootkop-Leander 132kV* power lines. The electricity generated by the facility is expected to be evacuated into one of these lines using a loop-in/loop-out connection.

The area required for the substation will be up to maximum of 20m x 5m in extent. Substations are constructed in the following simplified sequence:

Step 1: Survey the area
Step 2: Final design of the substation and placement of the infrastructure
Step 3: Issuing of tenders and award of contract to construction companies
Step 4: Issuing of tenders and award of contract to construction companies
Step 5: Vegetation clearance and construction of access roads (where required)
Step 6: Construction of foundations
Step 7: Assembly and erection of infrastructure on site
Step 8: Connect conductors
Step 9: Rehabilitation of disturbed area and protection of erosion sensitive areas
Step 10: Testing and commissioning

The power line looping into and out of the existing power line runs parallel to the site and will be approximately 15m – 20m in length. Power lines are constructed in the following simplified sequence:

Step 1: Survey of the route
Step 2: Selection of best-suited conductor, towers, insulators, foundations
Step 3: Final design of line and placement of towers
Step 4: Issuing of tenders and award of contract to construction companies
Step 5: Vegetation clearance and construction of access roads (where required)
Step 6: Tower pegging
Step 7: Construction of foundations
Step 8: Assembly and erection of towers on site
Step 9: Stringing of conductors
Step 10: Rehabilitation of disturbed area and protection of erosion sensitive areas
Step 11: Testing and commissioning

2.4. 8. Establishment of Ancillary Infrastructure

Ancillary infrastructure will include a workshop, storage areas, office and a temporary contractor's equipment camp. The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

2.4.9. Undertake Site Rehabilitation

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.

2.5. Operation Phase

The electricity that is generated from the PV panels will be stepped up through the on-site inverters and transformers at the on-site substation. This electricity will be fed into the electricity grid via a loop in loop out connection to the existing Eskom 132kV power line which is parallel to the proposed site. This power line, in turn, connects to the Grootkop substation.

It is anticipated that a full-time security, maintenance and control room staff will be based on site. Each component within the solar energy facility will be

operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities.

2.6. Decommissioning Phase

The operation phase of the project 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 by undertaking the decommissioning activities described below.

2.6.1 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.

2.6.2 Disassemble and Replace Existing Components

The components would be disassembled, 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) refers to that process (dictated by the EIA Regulations) which involves the identification and assessment of negative and positive environmental impacts (i.e. direct, indirect, and cumulative) associated with a proposed project. The EIA process generally forms part of the feasibility study for a proposed project, the outcomes of which inform the final design of a development.

The EIA process comprises the Scoping and EIA Phase which culminates in the submission of a Final EIA Report, together with an Environmental Management Programme (EMPr) to the Department of Environmental Affairs (DEA), as the competent authority for decision-making.

Figure 3.1: Phases of an EIA Process

The Scoping Phase for the proposed Grootkop PV Facility has been undertaken in accordance with the EIA Regulations (GNR543) 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 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 specialists with expertise relevant to the nature of the project and the study area, the project proponent, as well as a consultation process with key stakeholders, relevant government authorities, and interested and affected parties (I&APs).

This chapter outlines 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 (negative and positive) associated with all phases of the proposed development (i.e. design, construction, operation, and decommissioning) within the broader study area through desk-top specialist studies, including the review of existing baseline data and limited field investigations.
» 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 Phase.
» Consult with key stakeholders, relevant government authorities, and interested and affected parties (I&APs).
» 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 in the EIA Phase.

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

» Provide a description of the proposed project.
» 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.
» 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

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 (i.e. DEA).
» Undertaking a public involvement process throughout the Scoping Phase in accordance with Chapter 6 of Government Notice No R543 of 2010 in order to identify issues and concerns associated with the proposed project.

» 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.

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

As this is an energy generation project, deemed to be of national importance, the National DEA is the competent authority for this application. As the project falls within the Free State Province, the Free State Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) will act as a commenting authority for the project. Consultation with these authorities has been undertaken throughout the Scoping Phase. This consultation has included the submission of an application for authorisation to DEA, with a copy submitted to Free State DEDTEA. Authorisation to continue with the Scoping Phase of the project was granted as this application was accepted by DEA under the reference number **14/12/16/3/3/2/515** 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. Public Involvement and Consultation

The aim of the public participation process conducted 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.
» Comments received from stakeholders and I&APs is recorded and considered in the EIA process, where appropriate.

The following sections detail the tasks which were undertaken as part of the public participation process.

i. Identification and Registration of Interested and Affected Parties

The first step in the public involvement process was to initiate the identification of 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 to date include:

» Provincial and local government departments (including DEA, DEDTEA, SAHRA, Heritage Free State, Department of Water Affairs, Department of Agriculture and Land Reform, Department of Forestry; South African Roads Agency Limited etc.)
» Organs of State having jurisdiction in respect of any aspect of the activity, including:
  * Free State DEDTEA
  * Free State – Department of Agriculture
  * Free State - Roads and Public Works
  * Free State – Department of Water Affairs
    South African Heritage Resources Agency
  * SANRAL – Eastern Region
  * Heritage Free State
  * Matjhabeng Local Municipality
  * Lejweleputswa District Municipality
  * Eskom
  * National Department of Energy
  * National Department of Agriculture
» Potentially affected and neighbouring landowners and tenants
» Industry and business; and
» CBOs and other NGOs.

It must be noted that the process of identification of stakeholders and I&APs will be on-going throughout the EIA process.

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 I&AP database will be updated throughout the EIA process, and will act as a record of the parties involved in the public involvement process.

ii. Notification of the EIA Process

In order to notify and inform the public of the proposed project and EIA process and invite members of the public to register as I&APs an advert was placed in the following newspapers:

» Volksblad (English - 09 May 2013)

» Vista (Afrikaans - 09 May 2013)

A second advert was placed announcing availability of the draft scoping report for public review, as well as the date and venue of Scoping-phase public meeting. This advert appeared in the following newspapers:

» Volksblad (English - 22 May 2013)
» Vista (Afrikaans - 23 May 2013)

Site advertisements were placed on the site (gate of the farm), Odendaalsrus Local Municipality and Matjhabeng City Library in accordance with the requirements of the EIA Regulations. In addition to the advertisements and site notices, key stakeholders and registered I&APs were notified in writing of the commencement of the EIA process. Copies of all the advertisements, site notices and written notifications are included within Appendix D.

iii. Background Information Document

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

iv. Stakeholder Consultation

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.

v. Identification and Recording of Issues and Concerns

All comments received from stakeholders and I&APs on the proposed project are included in the Final Scoping Report. A Comments and Response Report has been 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 and meetings held during the scoping phase (refer to Appendix D).

3.2.3. Evaluation of Issues Identified through the Scoping Process

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

Specialist	Area of Expertise	Refer Appendix
Marianne Strohbach (Savannah Environmental)	Ecology	Appendix F
Johann Lanz	Soils and Agricultural Potential	Appendix G
Bhuti Dlamini	Wetland	Appendix H
Jaco van der Walt (Heritage Contracts and Archaeological Consulting CC)	Heritage and palaeontology	Appendix I
Lourens du Plessis (MetroGIS)	Visual and GIS Mapping	Appendix J
Tony Barbour (Tony Barbour Environmental Consultancy)	Social	Appendix K

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 studies are contained within Appendices F – K.

3.2.4. Public Review of draft Scoping Report and Feedback Meeting

This is the **previous stage** of the Scoping Phase. The draft Scoping Report has been made available for public review from **24 May 2013 – 24 June 2013** at the following locations:

» Welkom City Library
» Odendaalsrus Library
» www.savannahSA.com

In order to facilitate comments on the draft Scoping Report, a public meeting was scheduled to be held as follows:

» **Date:** 04 June 2013
» **Time:** 16h00
» **Venue:** Welkom City Library

In addition, all registered I&APs were notified of the availability of the report and public meeting by letter (refer to Appendix E).

3.2.5. Final Scoping Report

The final stage in the Scoping Phase entails 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 projects and the related statutory environmental assessment process.

3.3.1. Regulatory Hierarchy

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

» *Department of Energy:* This department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity). It is the

controlling authority in terms of the Electricity Regulation Act (Act No 4 of 2006).

» *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.

» *Department of Water Affairs (DWA):* This department is responsible for effective and efficient water resources management to ensure sustainable economic and social development.

» *Department of Forestry and Fishery (DAFF):* This department the custodian of South Africa's agriculture, fisheries and forestry resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector.

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

» *Provincial Government of the Free State – Department of Economic Development, Tourism and Environmental Affairs (DEDTEA).* This department is the commenting authority for this project.

» *Heritage Free State* - This is the provincial authority responsible for the management and conservation of heritage sites.

» Free State – Department of Agriculture – this is a provincial authority responsible for the management and conservation of agricultural land

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment. The site falls within the Matjhabeng Local Municipality which is part of the Lejweleputswa 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. The Matjhabeng and Lejweleputswa Municipality's IDPs will be used to inform the assessment of social impacts for EIA process.

There are also numerous non-statutory bodies and environmental lobby groups that play a role in various aspects of planning and the environment that will influence solar energy development (i.e. Sustainable Energy Society of South Africa).

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 final Scoping Report:

- National Environmental Management Act (Act No 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  - Public Participation in the EIA Process (DEA, 2010)
- International guidelines – the Equator Principles

Several other Acts, standards or guidelines have also informed the project process and the scope of issues 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 PV Facility

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

Legislation	Applicable Sections
	environment » NEMA EIA Regulations (GN R544, 545 & 546 of 18 June 2010) (published in terms of Chapter 5) » 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,

Legislation	Applicable Sections
	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 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.

Legislation	Applicable Sections
	» The Act provides listed 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 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 AFFECTED ENVIRONMENT CHAPTER 4

This section of the Final Scoping Report provides a description of the environment that may be affected by the proposed Grootkop Solar Energy Photovoltaic Facility. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects 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, 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 - K.

4.1. Regional Setting

Regionally the site for the proposed **Grootkop Solar Energy Facility** is located within the Matjhabeng Local Municipality, which forms part of the Lejweleputswa District Municipality, Free State Province. The proposed site identified for the facility is located approximately 9km south-east of Allanridge and about 6km north of Kutlwanong (at the closest).

The proposed site is located immediately south-west of the *Anglo Geduld-Grootkop 132kV* and *Grootkop-Leander 132kV* power lines. The electricity generated by the facility is expected to be evacuated into one of these lines using a loop-in/loop-out connection.

4.2. Location of the Study Area

The site is located within the Matjhabeng Local Municipality (refer to Figure 4.1), one of the five Local Municipalities that make up the Lejweleputswa District Municipality. The town of Welkom serves as the administrative seat of both the district and local municipalities. The total population of the municipality in 2001 was estimated to be 476 763.

The study area for the visual assessment encompasses a geographical area of 298km^2 and includes a minimum 8km buffer zone from the proposed development area. It includes the towns of Odendaalsrus, Kutlwanong, Nyakallong (part of Allanridge) as well as sections of the R30 and R34 arterial roads and a number of major secondary (local) roads.

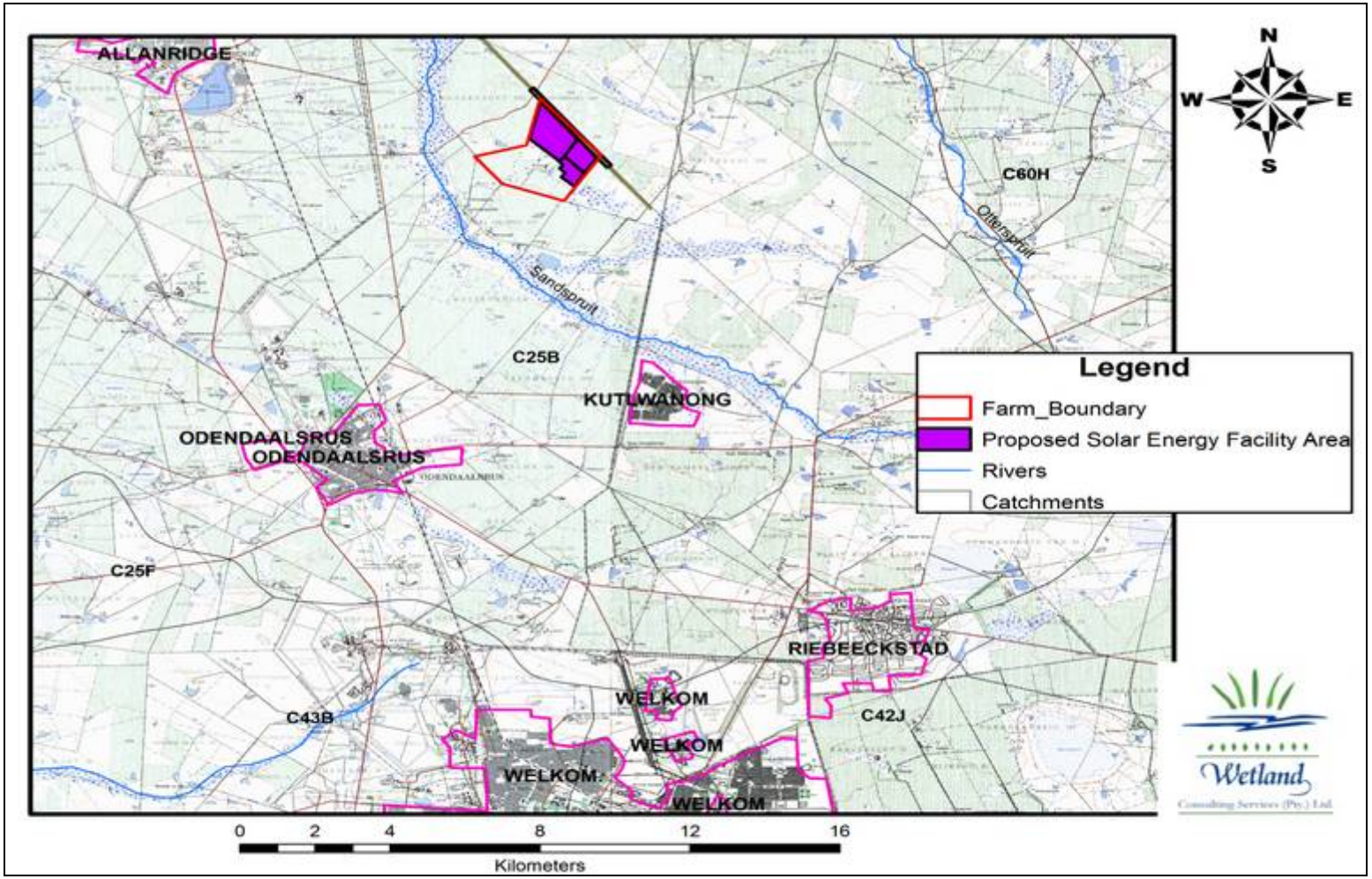

Figure 4.1: Location of the Matjhabeng local municipality within Lejweleputswa District Municipality, Free State Province

4.3. Infrastructure in the vicinity of the Development Site

The identified site for the proposed PV facility is situated approximately 9km by road south-east of Allanridge and 13km north-east of Odendaalsrus on the farm Hilton 30. This farm is located in an area that has a distinct rural and agricultural character, with very limited infrastructure development in the immediate surrounds of the site. Exceptions occur where 132kV power line infrastructure passes adjacent to the site, as well as smaller power lines located approximately 4km west of the site. These lines all congregate at the Grootkop substation located about 6.5km north-east of the site.

Access to the proposed development area is afforded by a secondary (local) road that joins the R30 at Odendaalsrus, to the south, or the R30 near Allanridge to the north.

4.4. Land Use

Land use activities within the broader region are predominantly described as maize and wheat farming, with some mining activity evident towards the west (Allanridge) and the south (Odendaalsrus) (refer to figure 4.2). Farm settlements or residences occur at irregular intervals throughout the study area. Some of these, in close proximity to the proposed development site, include: Hilton (located on the farm itself), Philadelphia, Sousvlei, Weltevrede and Melkkraal. The population density of the region is indicated as approximately 173 people per km^2, predominantly concentrated within the previously mentioned built-up centres.

The natural vegetation or land cover types of the region are described as *Grassland* and *Wetlands* (in the lower lying areas), with large tracts of agricultural fields (altered vegetation) interspersed. The higher lying sections of the study area are indicated as *Vaal-Vet Sandy Grassland*, whilst the lower lying sections along water courses are described as *Highveld Alluvial Vegetation*. Pans occur throughout the study area.

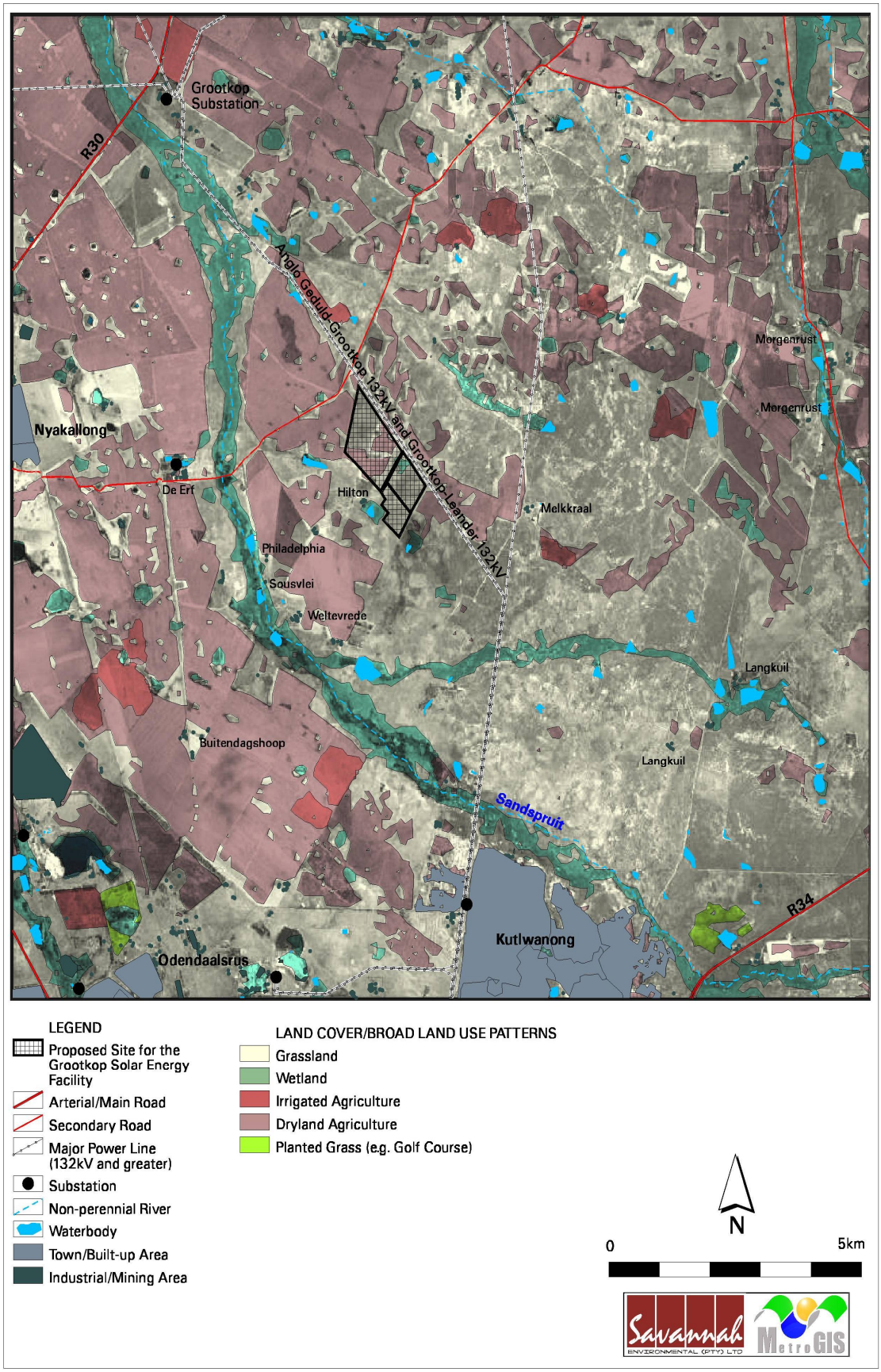

Figure 4.2: Land Use activities in the vicinity of the proposed Grootkop Solar Energy Facility

4.5. Climate

The climate for Grootkop has been derived from climatic data summarised for Welkom (SA Explorer), located about 20 km south of Grootkop. The area receives about 400 mm of rain on average per year. From May to September, rainfall is minimal, with most rainfall occurring from November to March, peaking between January and March. Temperatures in summer peak during December and January at a daily average of 29°C, with an average of 17°C for June. During July, night temperatures are on average 0°C, with frosts during winter common.

4.6. Social Characteristics of the Study Area

The Matjhabeng Local Municipality (MLM) incorporates Welkom, Odendaalsrus, Virginia, Hennenman, Allanridge and Ventersburg with a combined population of 406 461 people (based on Census 2011). The economy of the Matjhabeng Municipality area centres on mining activities located in and around Allanridge, Odendaalsrus, Welkom and Virginia. Manufacturing associated with the mining sector exists to a limited extent in the afore-mentioned towns. Other manufacturing activities are limited.

In terms of economic contribution, the Matjhabeng Local Municipality (MLM) is the most important LM in District. The MLM accounts for ~ 72% of the district's economic output followed by the Masilonyana LM with around 10.8%.

The statistics show that the economies of Welkom (53%), Odendalsrus (38%) and Virginia (78%) are dominated by mining, whilst Henneman is dominated by manufacturing (41%), agriculture (17%), trade (10%) and finance (10%). The total area percentages show a combined figure of 58% dominance by the mining sector. Approximately 98% of mining activities take place in Matjhabeng and Masilonyana LMs, while ~ 65% of agricultural output in the District comes from Tswelopele and Nala LMs. Approximately 84.8% of all manufacturing output is produced in Matjhabeng LM. A large percentage of the manufacturing is linked to the mining sector.

In terms of future economic development, there is likely to be a decline in the role played by mining, which will also impact negatively on employment in the Province. It is unlikely that the mining industry will ever again contribute more than its current contribution to GDP. In addition, the mining industries will never again absorb the percentages of labour that have historically been the case. The economic future of the agriculture also appears to be less than prosperous based on limited economic growth over the period from 1996 to 2004. However, the labour-absorption capacity of agriculture compared to other sectors is still relatively high. In addition, the ability of the agricultural sector to absorb low skilled labour is higher than the secondary and tertiary economic sectors.

However, the decline in the role of the mining sector in recent years has impacted negatively on the economic contribution of these two municipalities. Tourism is identified a key economic sector for the future. The FSPGDS identifies a number of strategies aimed at promoting the tourism sector. These include events tourism, such as sporting and festivals, weekend tourism, aimed at the market in the north and north-eastern of the Province, specifically Gauteng, and international tourists.

The town of Welkom, which is the administrative seat of both the LDM and MLM, has been badly affected by the decline in the mining sector and unemployment in the town has increased in recent years. The development of renewable energy facilities, such as the proposed solar energy facility, therefore has the potential to off-set some of the job losses in the mining sector, albeit limited in extent.

Bulk water infrastructure consists mostly of reservoirs and pipelines of Sedibeng Water. These supply all of the Matjhabeng towns and the mines with water from the Vaal River near Bothaville and to a lesser extent from the Sand River. The bulk electrical network is well established in the Matjhabeng area. Eskom provides electricity to all mines and towns in the Municipal area. There is currently sufficient bulk infrastructure available to serve the whole area. The rail network that passes through Hennenman and Virginia is a mainline service linking the Municipality with Gauteng, KwaZulu-Natal, Eastern Cape and the Western Cape. However, there is no local rail network or bus service operating in the Matjhabeng Municipality.

Socio-economic data from Census 2011 indicates that the population has decreased marginally from 408 170 in 2001 to 406 461 in 2011. The dependency ratio has stayed the same at 46.9. In terms of employment, unemployment has dropped from 46.5% to 37% in 2011. There has also been an improvement in the education levels, with the number of people with no schooling decreasing from 12.3% to 4.6%, and those with matric level education increasing from 18% to 28%. The level of services provided by government has also improved, with households supplied with flush toilets linked to sewage increasing from 62.4% to 81.1%, households with piped water within the house more than doubling from 25.9% to 54.8% and households provided with electricity growing from 69.9% to 91.1%. It is therefore reasonable to say that the quality of life of the residents of the MLM has improved since 2001.

4.7. Biophysical Characteristics of the Study Area and Surrounds

4.7.1 Ecological Profile

The selected property falls within the original extent of the Vaal-Vet Sandy Grassland (Unit Gh 10) as defined by Mucina and Rutherford (2006), merging into

Highveld Alluvial Vegetation on the banks of larger drainage lines and the Sandspruit.

Landscapes of the Vaal-Vet Sandy Grassland consist of slightly irregular undulating plains with vegetation dominated by low-growing tussock grasses and an abundance of karroid shrubs and succulents. The grass layer consists of a high diversity of grasses, of which species such as *Themeda triandra, Anthephora pubescens, Elionurus muticus, Eragrostis* and *Digitaria* species are typical. The low shrub component is dominated by *Felicia muricata, Helichrysum* species, *Pentzia globosa,* and *Anthospermum rigidum* (Mucina and Rutherford 2006). The diversity of the herbaceous layer may vary significantly from year to year depending on utilisation and rainfall amount and timing, which influence the germination of annuals and resprouting of species with woody below-ground rootstocks. The remaining extent of the Vaal-Vet Sandy Grassland has been listed in the threatened terrestrial ecosystems for South Africa (2011) as Endangered, as more than 63% of this vegetation type has been irreversibly transformed. Less than 0.3% of the ecosystem is protected in the Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit, and Soetdoring Nature Reserves.

The landscape and vegetation features of the Highveld Alluvial Vegetation (Unit Aza 5) can best be described as a flat topography, supporting riparian thickets dominated by *Acacia karroo* and accompanied by seasonally flooded grasslands. The grasslands on the floodplains are increasingly reduced to disturbed herb lands that are prone to invasion by alien plants. Important trees in this vegetation type include *Acacia karroo, Salix mucronata* subsp. *mucronata,* and *Ziziphus mucronata*. Characteristic shrubs are: *Searsia pyroides, Lycium hirsutum, Ehretia rigida,* and *Grewia flava*. Common grasses include *Setaria verticillata, Panicum maximum, Agrostis lachnantha,* and *Eragrostis plana* (Mucina & Rutherford 2006).

The conservation status of the Highveld Alluvial Vegetation is considered least threatened. The conservation target set for this vegetation unit is 31%, of which almost 10% is statutorily conserved in Baberspan (Ramsar site), Bloemhof Dam, Christiana, Faan Meintjies, Sandveld, Schoonspruit, Soetdoring, and Wolwespruit Nature Reserves. Dams and cultivation practices pose the biggest threats to this vegetation type. Weeds and invasive species readily establish in these riparian areas due to more favourable soil moisture and nutrient status, and such weeds are largely introduced from seeds washed down from smaller tributaries and upstream disturbed areas (Mucina & Rutherford 2006) (refer to Figure 4.3).

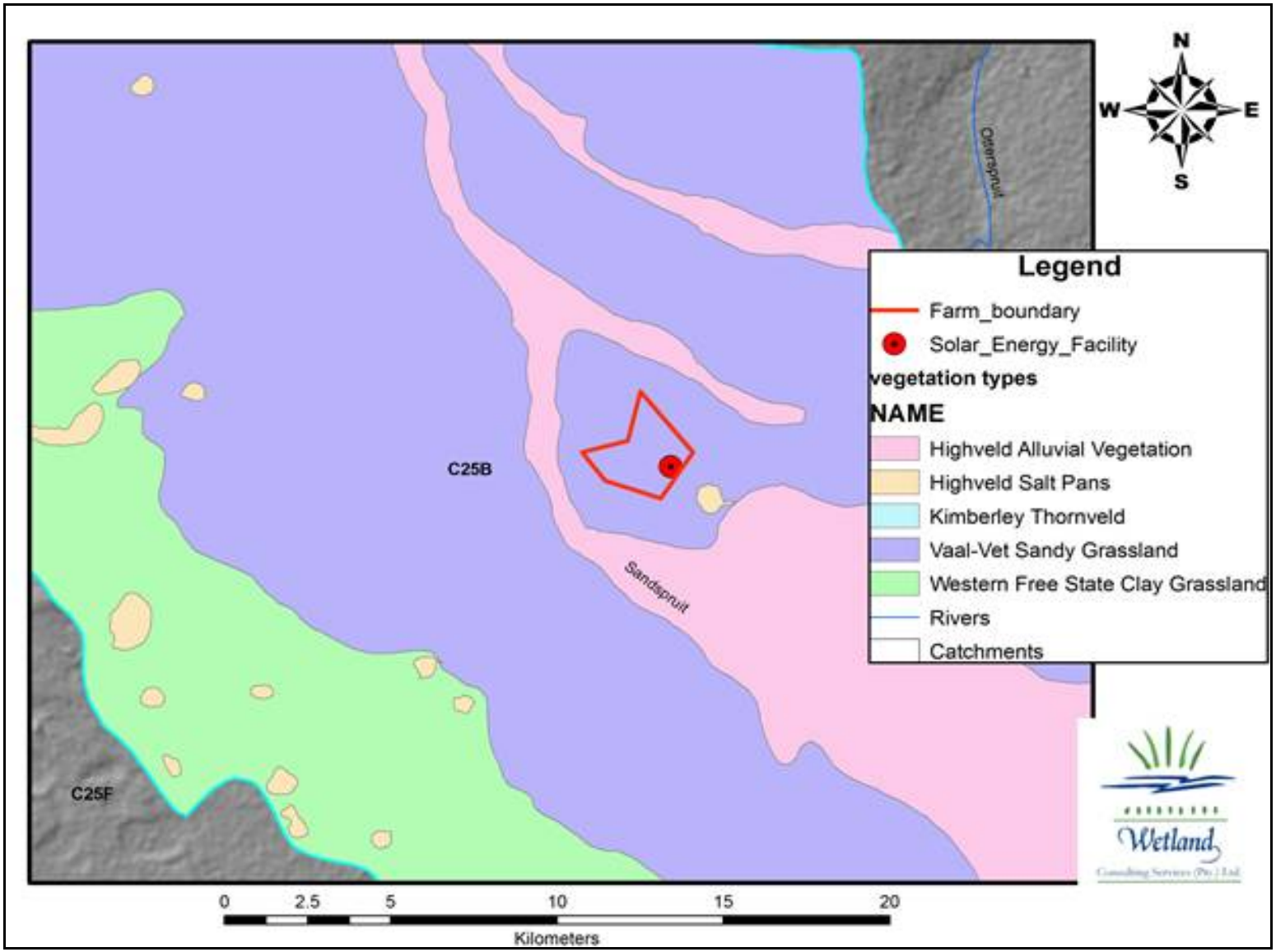

Figure 4.3: Overview vegetation of the proposed Grootkop Solar Energy Facility site and surrounding areas

A total of 371 plant species have been recorded in the Welkom/Allanridge Area according to the SANBI database. It is unlikely that all of these species will occur within the project area, whilst species not previously recorded may be present.

Of the previously recorded species, 24 are endemic to South Africa and 4 species have a red-data status. The presence of these species on site will have to be verified during a detailed field study.

The following have been used to describe the status of the species:

- ***P - Protected species***
- ***end - endemic to South Africa***
- ***VU - Vulnerable***
- ***EN - Endangered***
- ***DDT - Data Deficient - Taxonomically Problematic***
- ***NT - Near Threatened***

Table 4.1: Protected species within the proposed area

Species	Status
Brachystelma comptum	end, VU, P
Brachystelma glenense	end, DDT, P
Nananthus vittatus	DDT
Acalypha caperonioides var. caperonioides	DDT
Osteospermum lanceolatum	end, DDT
Boophone disticha	Declining, P
Drimia elata	DDT
Kniphofia ensifolia subsp. autumnalis	end, EN, P
Moraea debilis	end, EN, P
Sporobolus oxyphyllus	end, NT

During the ecological screening visit it could be verified that several bulbous species are present, of which several may be protected. It should however be possible to remove and successfully relocate the specimens which could be affected by the facility.

Currently, portions of the study area have been mapped on the BGIS website as remaining portions of the threatened Vaal-Vet Sandy Grassland. This delineation is, however, contradictory to mapped landcover classes as well as land use history confirmed on the ground. This discrepancy is most likely a result of insufficient ground-truthing of remotely sensed images during the mapping program of nationally threatened ecosystems. A full description of plant communities on the site and associated habitats will be provided after a field

study conducted during the growing season, which will also reveal where remaining threatened grassland vegetation may occur.

4.7.2 Soils and Agricultural Potential

The proposed solar energy facility site is on flat Free State plains, 9 km south east of the town of Allanridge. The land type classification is a nation-wide survey that groups areas of similar soil and terrain conditions into different land types. There is a single land type across the site, namely Ae39. Three other land types occur in the area (refer to figure 4.4).

The soils on site and across the surrounding area are predominantly deep, well-drained, red, loamy soils of the Hutton soil form. The soils of land type Db1, which surrounds the site, differ from the other soils in the area in that they are predominantly shallow soils on underlying clay.

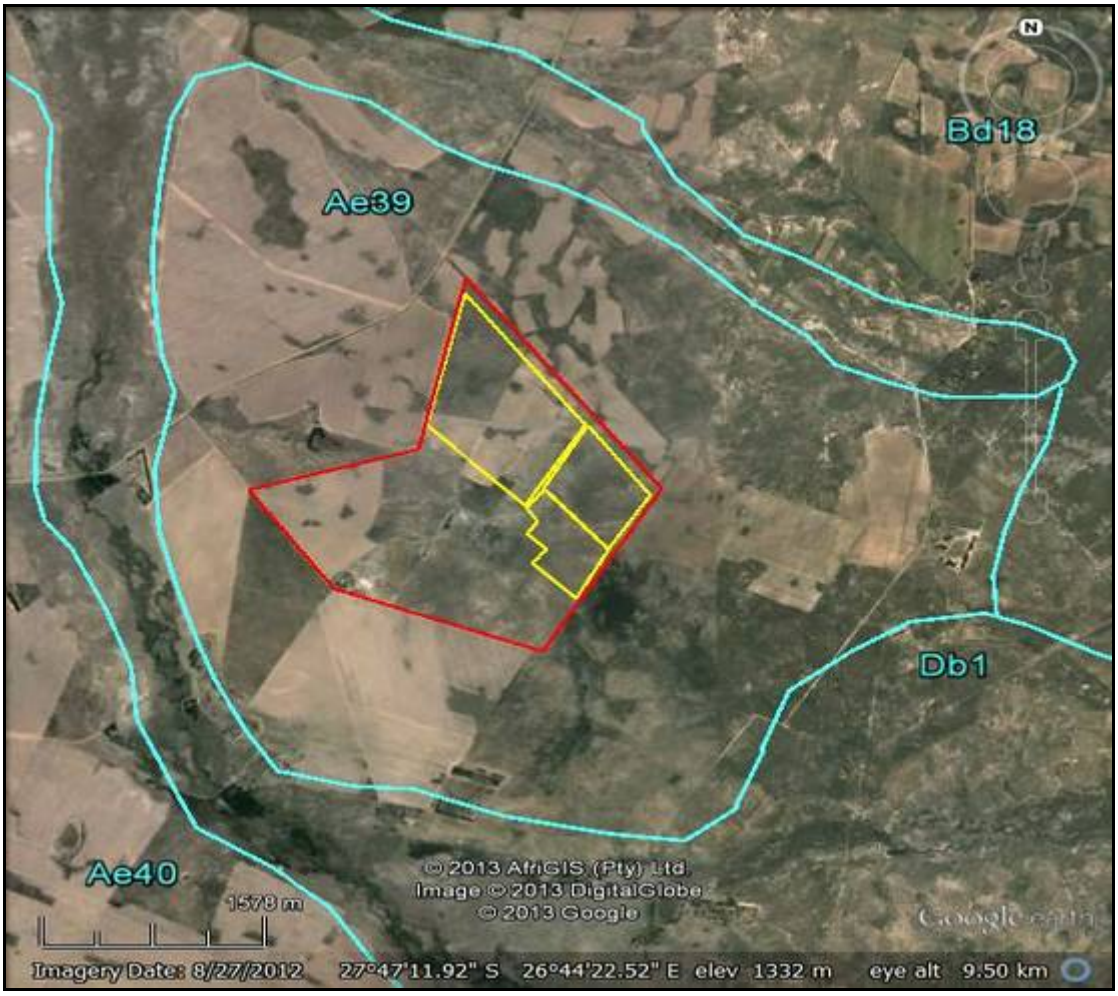

Figure 4.4: Soil classification map of the proposed Grootkop Solar Energy Facility

The regional geological formations of the area consist of Aeolian and colluvial sand overlying sand stone, mudstone and shale of the Karroo Supergroup (mostly

the Ecca Group) as well as the older Ventersdorp Supergroup andesites and basement gneisses in the north. Specifically within the project area the underlying geology consists of Shale. Dominant soil forms are mostly Avalon, Westleigh and Clovelly. From a wetland perspective, weathering of Shale produces sandy soil which typically supports a mosaic of hillslope seepage wetlands on site (refer to figure 4.5).

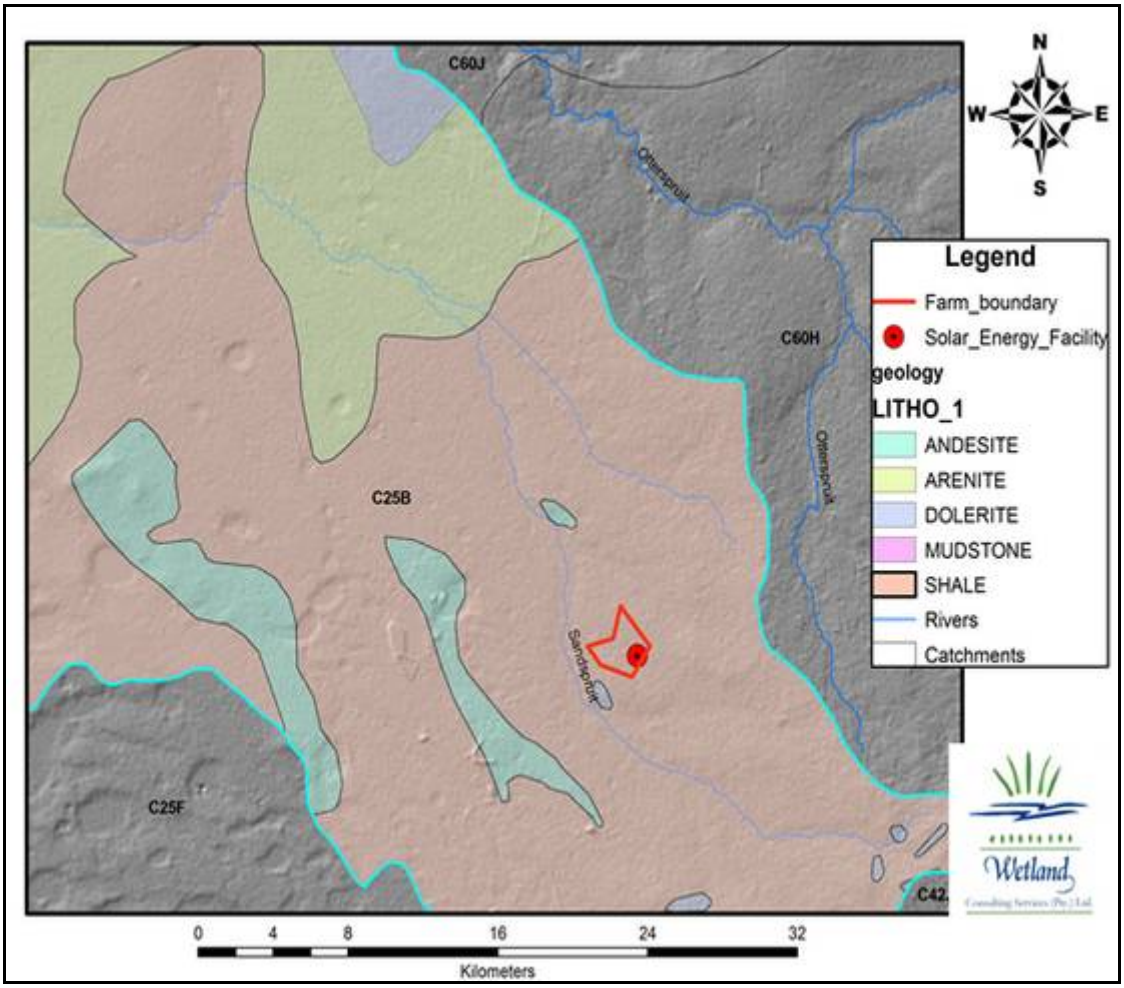

Figure 4.5: Geology underlying the proposed Grootkop Solar Energy Facility site and surrounding areas

Land capability is the combination of soil suitability and climate factors. The entire area has a land capability classification, on the 8 category scale, as: Class IV - marginal potential arable land.

Potential maize yield provides a good indication of agricultural potential across the site. It varies from 0.6 to 2.4 tons per hectare. The natural grazing capacity of the site is given as 11-15 hectares per large stock unit. Land use in the area includes maize, sunflower and groundnut production. There is no evidence of irrigated land on the site.

4.7.3 Geography and Terrain

The project site is in the vicinity of farm settlements or residences occur at irregular intervals. Some of these, in close proximity to the proposed development site, include: Hilton (located on the farm itself), Philadelphia, Sousvlei, Weltevrede and Melkkraal. The population density of the region is indicated as approximately 173 people per km^2, predominantly concentrated within the previously mentioned built-up centres.

The topography or terrain morphology of the region is broadly described as *plains and pans* of the Central Interior Plain (refer to figure 4.6). The slope of the entire study area is even (flat) with a very gradual drop (less than 70m) from the south-east (near the R34) to the north-west where the Sandspruit exits the study area. This non-perennial river, the pans and farm dams account for the dominant hydrological features within this region that receives between 500mm to 650mm rainfall per annum.

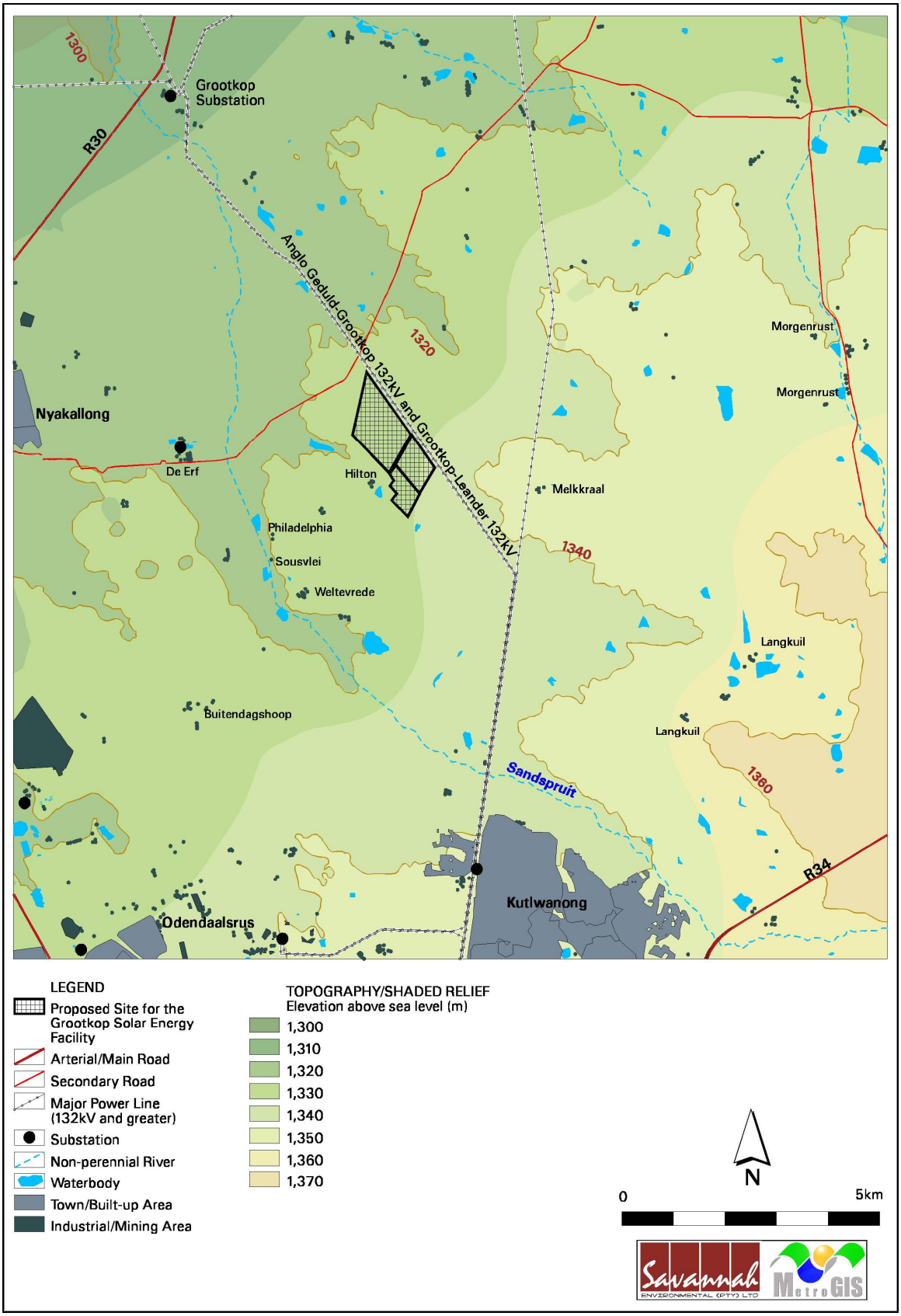

Figure 4.6: Topography of the proposed Grootkop Solar Energy Facility

4.8 Water Resources

The area affected by the proposed developments is located immediately to the south east of the town of Allanridge in the Free State province, and as such falls within the Vaal River Catchment (C), and more specifically within quaternary catchment C25B which is drained by the Sandspruit River and its tributaries (refer to figure 4.7). The area receives an average annual rainfall of approximately 509 mm, of which approximately 5mm (1 %) ends up as run-off.

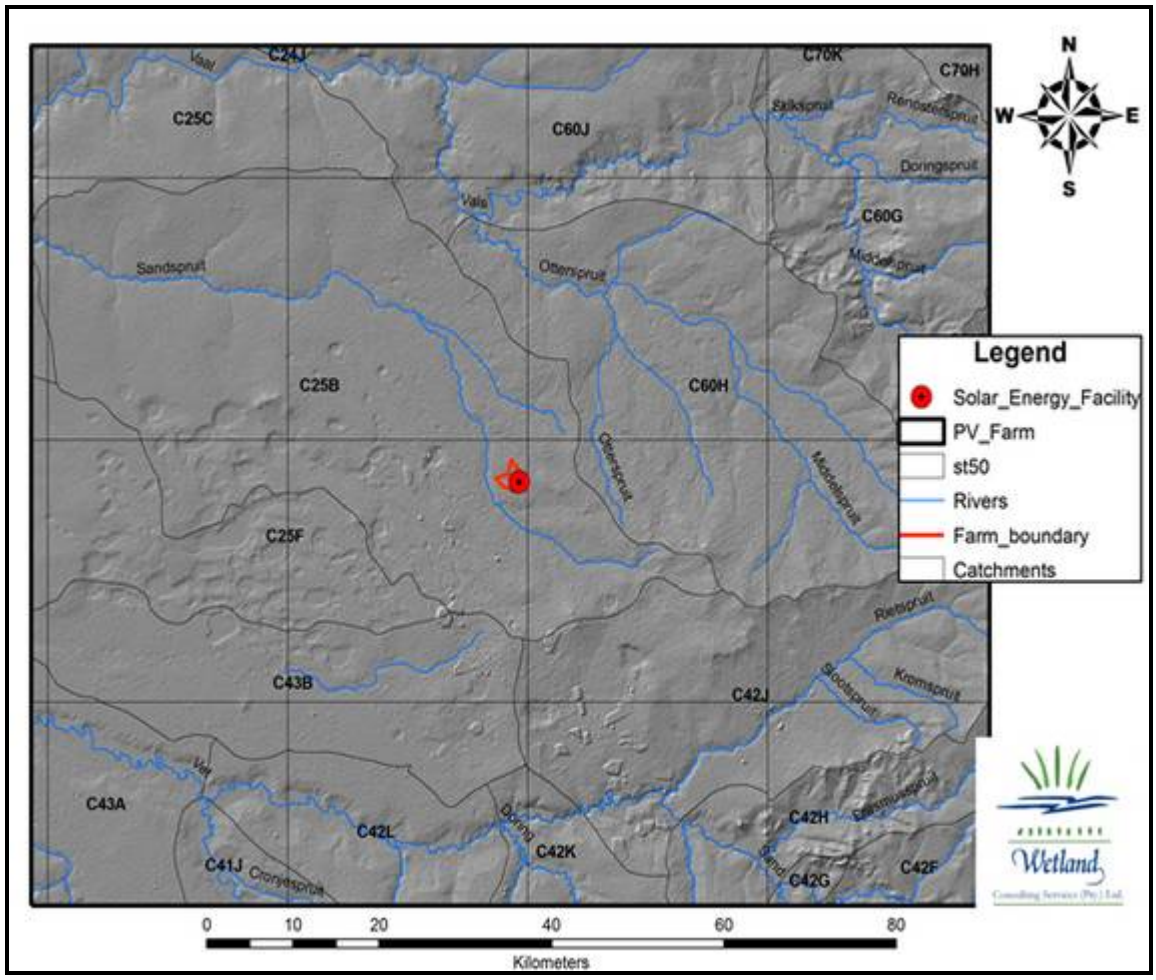

Figure 4.7: Map indicating the proposed Grootkop solar energy facility in relation to the quaternary catchments

4.8.1 Wetlands

Based on the recently published Atlas of Freshwater Ecosystem Priority Areas in South Africa (Nel et al., 2011), the Atlas indicates that wetlands do occur within or immediately downstream of the study area refer to figure 4.8). There are number of pans recorded within the study area in the National Wetland Inventory datasets. Figure 4.8 shows the general layout of the site including the wetland

FEPA and National wetland inventory data available within and around the project site.

Several wetlands have been identified within the footprint of the proposed Grootkop solar energy facility area and the buffer areas around it (refer to figure 4.8). The different types of wetlands that are expected to occur on site, or within 500m of the site boundaries, include:

» Pans;
» Hillslope seepage wetlands;
» Hillslope seepage wetlands feeding pans;
» Dams; and
» Valley bottom wetlands.

The identified wetlands, based on a desktop delineation of wetness and greenness signatures visible on Google Earth (GE) imagery supplemented by the old aerial photographs and available wetland datasets covering the site are illustrated. All of the areas identified as possibly being wetlands will be further investigated in the field and the presence of wetlands and the wetland boundaries will be verified as part the project EIA phase.

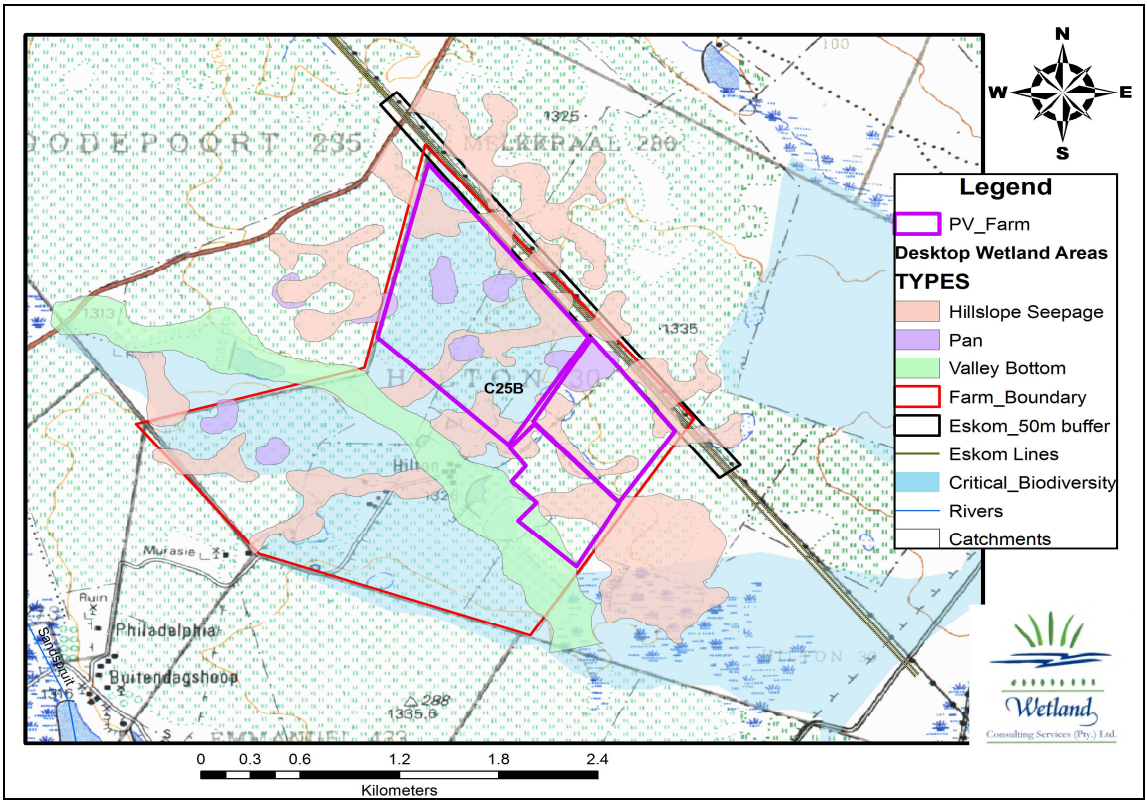

Figure 4.8: Desktop wetlands within the proposed Grootkop Solar Energy Facility

Based on the desktop mapping, delineated wetlands within the PV Farm boundary in Figure 4.8 above cover an approximate area of 33.5ha, of a total area of 80ha

(41.9%). As indicated previously all of the areas identified as possibly being wetlands will be further investigated in the field. Based on the desktop mapping, the suspected wetlands consist mostly of hillslope seepage wetlands and pans.

The proposed solar facility area is situated in the C25B catchment. In terms of receiving water resources that might be impacted by activities on site, these include the wetland areas and the major Sandspruit River that drains the entire immediate catchment area. The Sandspruit River is a tributary of the Vaal River. According to the National Freshwater Ecosystem Priority Areas data set (Nel et al., 2011), the Sandspruit River is in a moderately modified condition (PES C). In addition, a number of seasonal pans occur within and around the site. These could be of some importance in terms of biodiversity, potentially supporting pan-adapted aquatic invertebrates and associated vertebrates.

4.9 Heritage Profile

4.9.1. Palaeontological profile

The project area is completely underlain by Permian sedimentary rocks of the Volksrust Formation. This stratigraphic unit crops out along and forms a part of the basin fill sequence of the Main Karoo Basin along its north-eastern margin. Located approximately 6.5 Km to the west of the project area is a thin, north-west to south-east oriented inlier of the Late Achaean Ventersdorp Supergroup (consisting of the older Bothaville Formation and a younger Allanridge Formation) which forms basement for the Karoo Basin succession. Located approximately 12.5 Km to the south of the project area are exposures of the sediments of the Late Permian Adelaide Subgroup, Karoo Supergroup. The Adelaide Subgroup is stratigraphically younger than the Volksrust Formation and forms the basal portion of the Beaufort Group. There is a significant cover of Cainozoic regolith covering the entire region and, thus, also the Volksrust Formation bedrock (refer to figure 4.9).

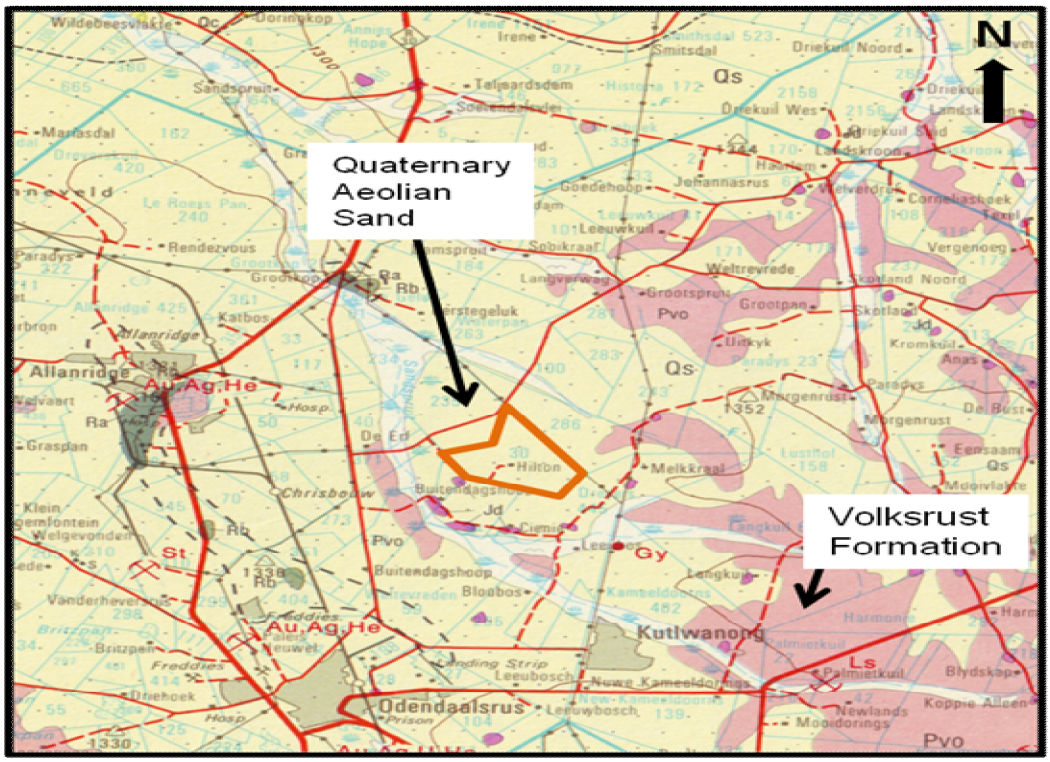

Figure 4.9: Map of the surface geology of the project area and its environs

(a) Cainozoic regolith

Geology

The proposed area has an aerially extensive cover of Cainozoic age regolith of unknown thickness over the entire project area. The legend of Geological Survey of South Africa 1: 250 000 geological map series 2726 Kroonstad indicates that these sands were deposited by aeolian processes. Cainozoic age palaeontological sites are occasionally identified in alluvial terraces and dongas throughout South Africa. It may be expected that large mammal bones, dentition, horn cores, micromammal bones and fresh water molluscs may be identified within strata of this age.

Palaeontological potential

If the aeolian sands are primary sediments there is a reduced palaeontological potential for the sequence. However, the author has person experience from elsewhere that some similar sequences represent fluvially reworked aeolian sands. If this is the case the palaeontological potential would be higher. Unfortunately, there is no information available to elucidate this question. No palaeontological materials are known to occur within these strata in the project area.

(b) Volksrust Formation

Geology

The Main Karoo Basin consists of a retro-arc foreland basin filled with a lithological succession ranging in age from the Late Carboniferous to the Middle Jurassic (Johnson *et al*., 2006). The basin-fill sequence wedges out northwards over the adjacent Kaapvaal Craton.

In the Main Karoo Basin of South Africa the Volksrust Formation is a predominantly argillaceous unit that interfingers (i.e., is transitional with and partially time equivalent to) the overlying Beaufort Group and the underlying Vryheid Formation. The formation consists of grey to black silty shale with thin, usually bioturbated, siltstone or sandstone lenses, particularly toward its upper and lower boundaries with the more sandstone-rich Adelaide Subgroup and Vryheid Formation respectively (Johnson *et al*., 2006). To the south and south-east the Volksrust Formation grades laterally into undifferentiated, deep-water argillites of the Ecca Group. The substantial thickness of predominantly argillaceous rocks and great lateral extent of the Volksrust Formation suggest that this unit represents a transgressive, open "shelf" sequence consisting predominantly mud deposited from suspension (Johnson *et al*., 2006). The increased grain size in the upper and lower portions of the formation indicates, in part,

The Volksust Formation is one of sixteen (16) recognised stratigraphic units that constitute the Permian Ecca Group. During the deposition of the Ecca Group the basin was dominated by a large sea (the salinity levels of this water body remain unresolved). The exception to this model was the deposition of the coal-bearing strata of the Vryheid Formation along the northern margin during an episode of deltaic progradation into the basin.

Genetically the Volksrust Formation represents a time of deep-water deposition of muds along the northern margin of the Main Karoo Basin following a rise in relative water level and the resultant inundation and drowning of the coal swamps and fluvial-lacustrine environments that deposited the underlying Vryheid Formation. Deposition of the Volksrust Formation was terminated by a progressive infilling of the basin and the resultant, widespread deposition of the terrestrially deposited, fluvio-lacustrine strata of the Beaufort Group.

Palaeontological Potential

The most conspicuous and common components of the palaeontological record of the Ecca Group in general are the plant macrofossils of the *Glossopteris* flora. Two large and conspicuous leaf form taxa dominate the *Glossopteris* flora; these being *Glossopteris* and *Gangamopteris*. Within the upper Ecca (containing the Volksrust Formation) *Gangamopteris* has ceased to be present with only

Glossopteris present (Anderson and McLauchlan, 1976). The palaeobotanical record of the Ecca Group is diverse and the literature describing it is voluminous (numerous papers having been published by E. Plumstead, H. Anderson, J. Anderson, E. Kovaks-Endrődy and M. Bamford amongst many others). A comprehensive review of the flora in the Karoo Basin literature is, accordingly, beyond the scope of this study, but a thorough review of the palaeobotanical content of the Ecca Group in general and the Volksrust Formation in particular is presented in Bamford (2004). In that summary it is indicated that the Volksrust formation can be expected to contain the macroplant fossils *Buthelezia*, *Sphenophyllum*, *Rangia*, *Phyllotheca*, *Schizoneura*, *Sphenopteris*, *Noeggerathiopsis*, *Taeniopteris*, *Pagiophyllum* and *Benlightfootia* and the wood tax *Australoxylon* and *Prototaxoxylon*. To these records can be added those of Tavener-Smith *et al*., (1988) who recorded the presence of *Glossopteris* and *Vertebraria* to the palaeontological record of the formation

In portions of the formation that are typified by low thermal alteration abundant assemblages of palynomorph plant microfossils (including acritarchs) can be expected (Anderson, 1977). Animal body fossils are rare within the Ecca Group in general (excepting the faunas of the Whitehill Formation). Within the Volksrust Formation the large pelycopod bivalve *Megadesmus* has been recorded near the boundary with the Beaufort Group (Cairncross *et al*., 2005). A locality containing beetles (Coleoptera) have been recorded from the formation in Kwazulu-Natal (Ponomarenko & Mostovski, 2005).

Jubb and Gardiner (1975) report the presence of fragmentary fish fossils within the Ecca sequence of southern Africa; these being *Coelacanthus dendrites* from the Somkele coal-field of northern Natal and *Namaicthys digitata* from the Senge coal-fields of Zimbabwe elsewhere. While fish faunas are obviously rare and none have been reported from the Volksrust Formation the possibility remains that they may be present. No reptile fossils have been identified within this formation.

Tavener-Smith *et a*l., (1988) document the prescence of trace fossils they ascribed to *Planolites* type, *Skolithus*, *Scolicia*-like trails, burrows similar to *Teichichnus* and *Palaeophycus* burrows present in the formation in Zululand. Hobday and Tavener-Smith (1975) reviewed trace fossil assemblages identified within the underlying Vryheid Formation. Within that fossil assemblage they identified two forms (*Helminthiopsis* and *Taphrelminthopsis)* within horizontally laminated siltstones and mudstones that represent part of the deep water *Nerites* community. While these taxa were not found within the Volksrust Formation that stratigraphic unit that stratigraphic unit was also deposited within deep water and, as such, similar deep water trace fossil forms may also be expected to be present within the unit.

4.9.2. Heritage Profile

The topography of the area is relatively flat and is utilized for extensive agricultural purposes. Three "clusters" of buildings exist on site associated with farm houses and outbuildings. Several pans and dams are found in the eastern portion of the farm. The 132 KV power line from Grootkop to Kutlwanong form the north eastern boundary of the site and will be used for connection into the grid.

Based on the current information obtained for the area at a desktop level it is anticipated that any sites that occur within the proposed development area will have a Generally Protected B (GP.B) field rating and all sites should be mitigatable and no red flags are identified. However pans could be archaeologically sensitive and should rather be avoided. This assumption will have to be tested by a field visit.

SCOPING OF ISSUES ASSOCIATED WITH THE PROPOSED PROJECT CHAPTER 5

This chapter serves to describe and evaluate the identified potential environmental impacts associated with the proposed Grootkop photovoltaic energy facility project, to identify gaps in knowledge, and to make recommendations for further studies required to be undertaken in the EIA phase, and/or recommendations for the management of these impacts through inclusion in the Environmental Management Programme (EMPr).

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 these phases:

» Identify 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 within the broader site, if applicable.
» Summarise the potential impacts that will be considered further in the EIA Phase through specialist assessments.
» Identify which activities may potentially affect the surrounding environment/receptors and provide recommendations for studies required within the EIA Phase.

5.2. Potential Impacts, Sensitive Environments and Receptors

The significance of impacts associated with a particular solar energy facility is dependent on site-specific factors, and therefore impacts can be expected to vary significantly from site to site. Impacts are expected to be associated with both the construction and operational phases of the proposed facility.

Construction of photovoltaic solar energy projects typically includes land clearing for site preparation and access routes; transportation of supply materials; construction of foundations involving excavations and placement of concrete (if relevant); and testing and commissioning of new infrastructure.

[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.

Decommissioning activities may include removal of project infrastructure and site rehabilitation. Environmental issues associated with the construction and decommissioning activities may include, amongst others, impacts on land use, soil erosion and threats to biodiversity and ecological processes, including habitat alteration and impacts to wildlife.

Environmental issues specific to the operation of a solar energy facility include visual impacts; impacts on biodiversity, positive and negative social impacts and impacts on agricultural potential and land use of the development site.

These and other environmental issues have been identified through a scoping evaluation of the proposed facility. The scoping process has involved input from specialist consultants and the project proponent.

The proposed facility has the potential to have an impact on the following environmental receptors (prior to the implementation of mitigation measures):

» **Ecology, fauna, and flora:** the disturbance associated with activities during the construction phase may affect flora and fauna populations through disturbance or destruction of habitat. During the operational phase, regular maintenance activities may affect flora and fauna due to disturbance.
» **Agricultural potential:** construction activities such as excavations and the presence of construction equipment on site may lead to soil pollution which could affect the agricultural potential and land capability of the area. Furthermore the utilisation of the development footprint will result in the area not being available for agricultural purposes during the operational phase.
» **Erosion potential:** excavation activities during the construction phase and water run-off during the operational phase has the potential to affect the soil conditions and erosion potential of the site.
» **Wetland:** construction activities of the proposed facility may impeded on water recourses
» **Heritage sites and fossils:** disturbance to or destruction of heritage sites and fossils may result during the construction phase.
» **Visual quality and aesthetics:** The construction and operation of the PV facility, and particularly the associated infrastructure (i.e. power lines) has the potential to impact on the visual quality of the landscape.
» **Social characteristics:** The construction and operational phases of the proposed facility may result in both temporary and/or longer term employment opportunities, most likely to be of a basic and semi-skilled nature. The influx of construction workers and/or potential job seekers could impact on existing infrastructure and social behaviour such as crime and the spread of diseases within local communities.

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. Potential direct and indirect impacts of the proposed photovoltaic energy facility are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. In evaluating impacts associated with the proposed project, it has been assumed that although during **operation** the area affected will comprise solar panels with an export capacity of up to 75 MW, access roads and a substation footprint which will be limited to ~240ha, a larger portion of the site could suffer some level of disturbance during **construction** as a result of the required activities on site.

5.3. Cumulative impacts

The **cumulative impacts** associated with the proposed PV facility are expected to be associated with the extent of the proposed Grootkop PV Facility development, as well as other developments in the area. At this stage, the number of facilities that would actually be established in the broader area is unclear as this is dependent on each project being selected by the Department of Energy through a competitive tendering process. Developers who have been awarded status as a preferred bidder through this process are only likely to have facilities that may be developed. Prior to construction these facilities are still required to obtain a number of licences and approvals in terms of South African Legislation.

The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact on the surrounding area as well as impacts on vegetation and soils. As required in terms of the EIA Regulations, cumulative effects will be considered in the detailed specialist studies to be undertaken in the EIA phase.

5.4. Assumptions made during the evaluation of Potential Impacts

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

Table 5.1: Evaluation of potential impacts associated with the construction phase of the proposed Grootkop Solar Energy Facility

Impacts on Ecology (Flora, Fauna and Ecosystems)

The selected property falls within the original extent of Vaal-Vet Sandy Grassland as described by Mucina and Rutherford (2006), a large portion of which on the property has been previously transformed. The remaining extent of this vegetation type has been listed in the threatened terrestrial ecosystems for South Africa (2011) as Endangered. Beyond the proposed development area, closer to larger drainage lines and small rivers, the grassland vegetation merges into Highveld Alluvial Vegetation, which is considered as least threatened (refer to figure 5.1).

During the ecology screening visit, it could be confirmed that the largest portion of the area regarded as suitable for the PV facility is situated on either cultivated lands or previously transformed lands that have been reverted to grazing lands. A small portion of the area is remaining natural grassland, but it is relatively degraded, most likely due to shallow soils and long periods of fragmentation.

Issue	Nature of Impact	Extent of Impact	No Go Areas
Disturbance or loss of indigenous natural vegetation	Construction of infrastructure may lead to direct loss of semi-natural vegetation, causing a reduction in the overall extent of specific species and vegetation cover. Consequences of the potential impact of loss of indigenous semi-natural vegetation occurring may include: » Increased vulnerability of remaining vegetation portions to future disturbance, including erosion; » General loss of habitat for sensitive species; » General reduction in biodiversity; » Disturbance to processes maintaining biodiversity and ecosystem goods and services; or » Direct loss of ecosystem goods and services.	Local	The only "no-go" areas so far identified are confirmed wetland areas (refer to Figure 5.1); areas of potential high sensitivity relate only to the possible presence of more wetlands. A more detailed investigation will be undertaken as part of the EIA phase.
Disturbance or loss of threatened / protected plants	Several protected or threatened plant species occur on and adjacent to the proposed development site. Flora is affected by loss or change of habitat due to infrastructure development, as plants are immobile. In the case of threatened plant species, a loss of a population or individuals could lead to a direct change in the conservation status of the	Local	A *Scilla* species and *Ammocharis coranica* could be identified as protected species. Both are geophytes that can be relocated successfully.

	species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences of this may include: » Fragmentation of populations of affected species » Reduction in area of occupancy of affected species Loss of genetic variation within affected species		Due to the previous transformation of most of the area, the presence of critical habitats for any species is unlikely.
Loss of habitat for threatened and /or protected vertebrates	Threatened animal species are indirectly affected primarily due to loss or alteration of habitat. Animals are generally mobile and, in most cases, can move away from a potential threat. Threatened species include those classified as critically endangered, endangered, or vulnerable. For any other species, a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a population or individuals could lead to a direct change in the conservation status of the species. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include: » Reduction in area of occupancy of affected species; and » Loss of genetic variation within affected species. These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species overall survival chances. There are a number of vulnerable and one endangered species that could occur in the study area, but there are no threatened, near threatened or protected species that occur in restricted habitats in the proposed study area. The presence of these red data fauna species could not be confirmed	Local	The only "no-go" areas so far identified are confirmed wetland areas (refer to Figure 5.1); areas of potential high sensitivity so far relate only to the possible presence of more wetlands. A more detailed investigation will be undertaken as part of the EIA phase. It is not anticipated that these small wetlands constitute any critical habitat for any fauna species. Due to the previous transformation of most of the proposed development area within the site, the presence of critical habitats for any species is unlikely.

Establishment and spread of declared weeds and alien invader plants.	Major factors contributing to the invasion by alien invader plants includes high disturbance (such as clearing for construction activities or past cultivation) and unsustainable grazing practices. Exotic species are often more prominent near infrastructural disturbances than within less disturbed natural vegetation. Consequences of this may include: » Loss of indigenous vegetation; » Change in vegetation structure leading to change in various habitat characteristics; » Change in plant species composition; » Change in soil chemical properties; » Loss of sensitive habitats; » Loss or disturbance to individuals of rare, endangered, endemic and/or protected species; » Fragmentation of sensitive habitats; » Change in flammability of vegetation, depending on alien species; » Hydrological impacts due to increased transpiration and runoff; and » Impairment of wetland function.	Local	Several alien species were observed on and around the project that will need eradication and subsequent control. At present, the number of plants per invasive species and extent of occurrence on the study area is low. A full list of species will be provided in the EIA phase.
Gaps in knowledge & recommendations for further study » The initial desk-top and screening investigation of the study area indicates that placement of components of the solar energy facility will mostly be on previously transformed semi-natural areas. A few protected species are expected to occur on and around the site. However, it is unlikely that the development, once the final layout has been designed in accordance to findings of a field investigation, will compromise the survival of any of the species of conservation concern. » The presence and delineation of all wetlands will need to be confirmed by a detailed wetland study (see below). » The BGIS database indicates more wetlands than could be identified to date within the study area, and this needs to be verified by the wetland study. » It must be noted that there is a possibility of species that have not been captured in the POSA SANBI species database for the area up to date, may in fact be found within the study area. » A detailed ecological survey and sensitivity assessment will be undertaken during the EIA phase			

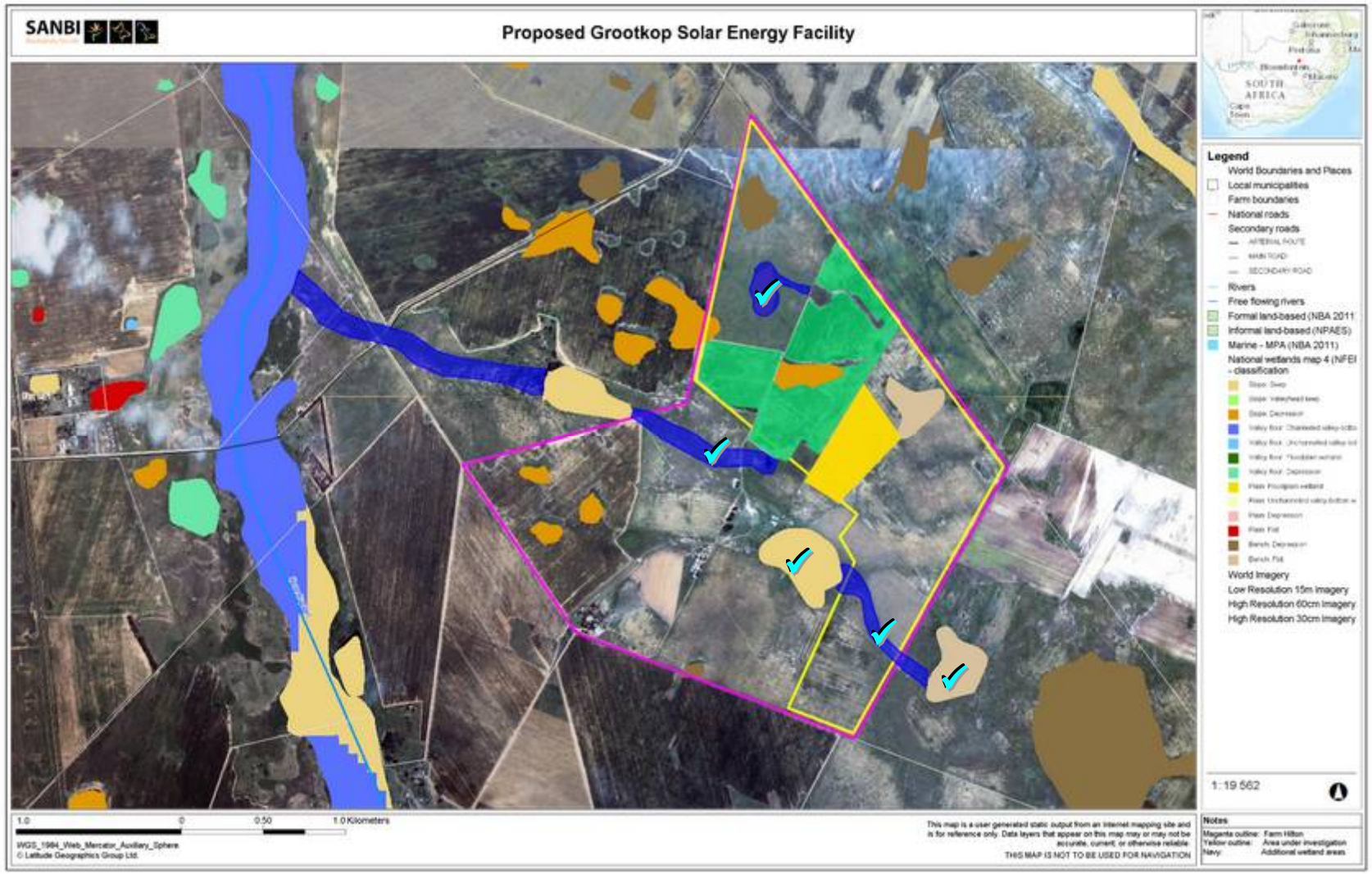

Figure 5.1: Ecological sensitivity map for the proposed Grootkop Solar Energy Facility

Impacts on Soil and Agricultural Potential

The proposed energy facility site is on flat Free State plains, 10 kilometres north east of the town of Odendaalsrus. Rainfall for the site is given as 505 mm per annum with a standard deviation of 115 mm according to the South African Rain Atlas (Water Research Commission, undated). The soils on site and across the surrounding area are predominantly deep, well-drained, red, loamy soils of the Hutton soil form. The soils of land type Db1, which surrounds the site, differ from the other soils in the area in that they are predominantly shallow soils on underlying clay.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Land surface disturbance and alteration	Construction activities, vegetation removal, and the establishment of hard standing areas and roads, and its resultant potential impact on erosion. Erosion will cause loss and deterioration of soil resources.	Local	Cultivated areas
Loss of topsoil	Poor topsoil management (burial, erosion, etc) during construction could result in related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's agricultural suitability.	Local	None
Placement of spoil material	Placement of material generated from construction related excavations which can cover agricultural land and thereby render it unsuitable for future agriculture.	Local	None

Gaps in knowledge & recommendations for further study

» All the information on soils and agricultural potential in this report has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

The EIA phase assessment will include:

» Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on agricultural resources and production.
» Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
» Assess the status of the land including erosion, vegetation and degradation.
» Describe the topography of the site.
» Do basic climate analysis and identify suitable crops and their water requirements.
» Summarise available water sources for agriculture.

» Describe historical and current land use and agricultural infrastructure on and surrounding the site, as well as possible alternative land use options.
» Determine and map the agricultural potential of the site.
» Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for identified impacts.

Impacts on Wetlands

The proposed solar facility area is situated in the C25B catchment. In terms of receiving water resources that might be impacted by activities on site, these include the wetland areas and the major Sandspruit River that drains the entire immediate catchment area (refer to figure 5.2). The Sandspruit River is a tributary of the Vaal River. According to the National Freshwater Ecosystem Priority Areas data set (Nel et al., 2011), the Sandspruit River is in a moderately modified condition. In addition, a number of seasonal pans occur within and around the site. These could be of some importance in terms of biodiversity, potentially supporting pan-adapted aquatic invertebrates and associated vertebrates.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Impacts on wetlands	The site is in a semi-arid area. The generally low slopes and soil conditions in the area have, over time, created many smaller wetlands – ranging from insignificant depressions to seepage areas, insignificant drainage lines, pans, and rivers. Several of these wetland types have been mapped by the BGIS database on the study area, and several of these small wetlands could be confirmed. According to the landowner, the construction of the R34 between Odendaalsrust and Kroonstad significantly reduced inflow to the larger wetlands on the study area, most likely due to modified below-ground seepage patterns. Construction of the PV array, if it occurred within the immediate catchments of any of these wetland areas, would lead to some direct or indirect changes to the surface hydrology of these areas, but would not greatly affect the seepage of water into lower-lying wetlands. This effect on the hydrology of the larger landscape or loss of habitat for species that depend on this habitat type should be minimal, if a	Local	The only "no-go" areas so far identified are confirmed wetland areas (refer to Figure 5.1); areas of potential high sensitivity relate only to the possible presence of more wetlands. A more detailed investigation will be undertaken as part of the EIA phase

	suitably wide buffer zone will be maintained between the wetlands and the proposed development. Further recommendations will depend on the wetland study during the EIA phase.		
Loss of wetland and habitat	Construction activities, removal, and the establishment of hard standing areas and roads, and its resultant potential impact on erosion. Erosion will cause loss and deterioration of soil resources.	Local	Wetland area (refer to figure 5.3)
Soil compaction	Poor topsoil management (burial, erosion, etc) during construction could result in related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's agricultural suitability.	Local	Wetland areas (refer to figure 5.3)
Deterioration of water quality	Placement of material generated from construction related excavations which can cover agricultural land and thereby render it unsuitable for future agriculture.	Local	Wetland areas (refer to figure 5.3)

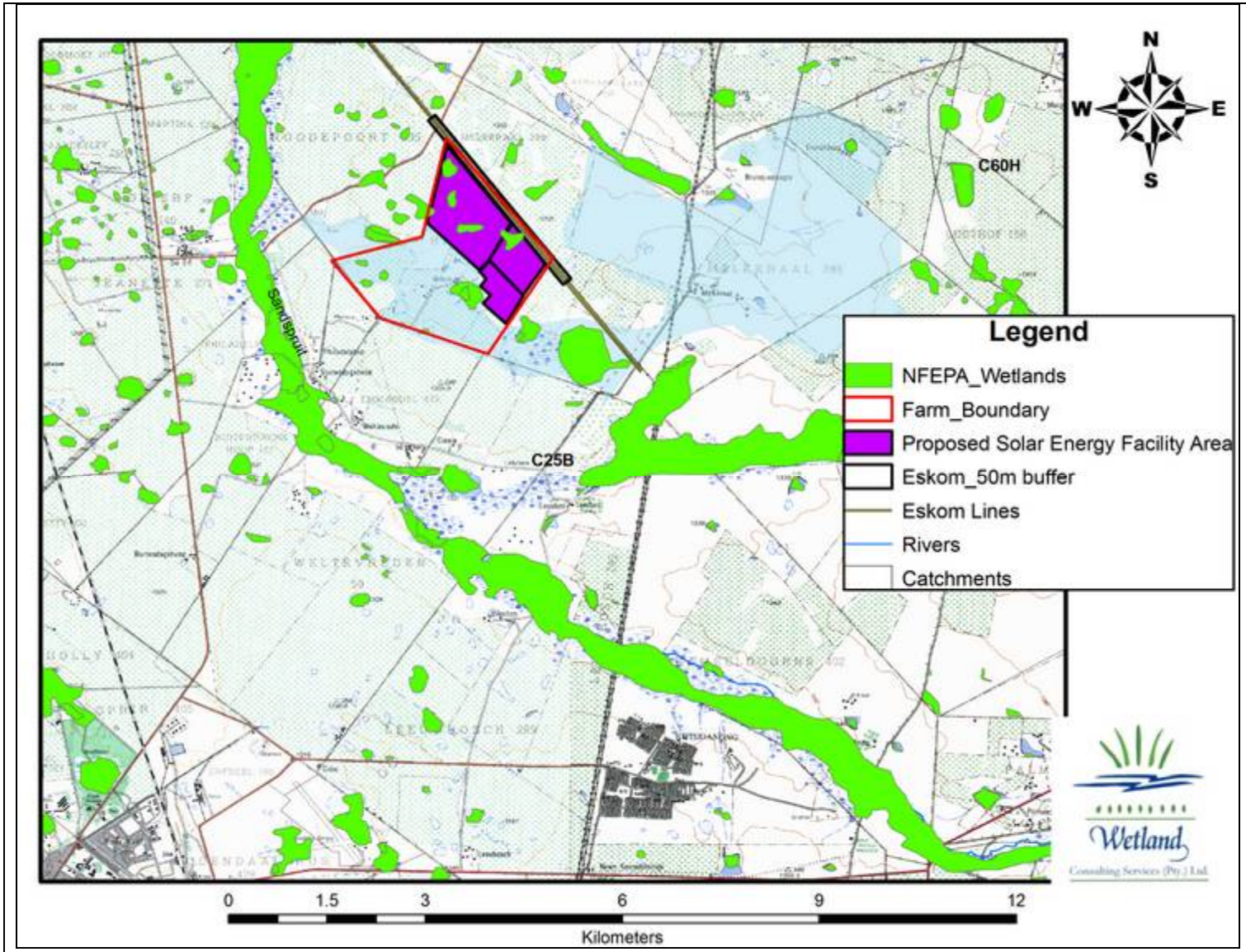

Figure 5.2: Wetland areas within the proposed Grootkop solar energy facility and surrounding area

Gaps in knowledge & recommendations for further study

The EIA phase assessment will include:

» Undertake field investigations.
» Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on agricultural resources and production.
» Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
» Assess the status of the land including erosion, vegetation and degradation.
» Describe the topography of the site.
» Do basic climate analysis and identify suitable crops and their water requirements.
» Summarise available water sources for agriculture.
» Describe historical and current land use and agricultural infrastructure on and surrounding the site, as well as possible alternative land use options.
» Determine and map the agricultural potential of the site.
» Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for identified impacts.

Impacts on the Heritage Resource

The heritage study for the proposed area revealed that:

» There is a low to medium likelihood of finding MSA artefacts and a medium likelihood of finding LSA finds around pans.
» No Iron Age sites have been recorded in the wider study area and there is a low likelihood of finding sites of this period in the study area.
» Historical finds include middens, structural remains and cultural landscape.

The desktop study highlighted that the farmhouse is older than 60 years and features dating to this period associated with farming can occur.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Stone age finds: ESA, MSA, LSA,	Subsurface excavations including ground levelling, landscaping, and foundation preparation	Local	None
Iron Age finds: EIA, MIA and LIA	Subsurface excavations including ground levelling, landscaping, and foundation preparation	Local	None
Historical finds: periods, dumps, remains and cultural landscape	Subsurface excavations including ground levelling, landscaping, and foundation preparation	Local	None
Living heritage i.e. rainmaking sites	Subsurface excavations including ground levelling, landscaping,	Local	None

	and foundation preparation		
Burial/cemeteries: over 100 and younger than 60 years	Subsurface excavations including ground levelling, landscaping, and foundation preparation	Local	None

Gaps in knowledge & recommendations for further study

» The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area from the desk-top study undertaken is applicable to the study area.
» A detailed heritage impact assessment must be undertaken as part of the EIA phase of the process in accordance with the requirements of the National Heritage Resources Act.
» It is recommended that as part of the public consultation process, the presence of graves, archaeological and historical sites should be determined.

Impacts on Paleontology

Two stratigraphic units are identified as underlying the project site, these being (in descending stratigraphic order):

1. Cainozoic regolith
2. Volkrust Formation

The Cainozoic regolith and the Volksrust Formation are both potentially fossiliferous and their stratigraphic equivalents are known to contain fossils elsewhere in South Africa. Accordingly, it may be reasonably expected that scientifically and culturally significant fossils may be present within the project area. The significance of any fossil material that may be present within the rocks underlying the project area is further heightened by the general lack of knowledge of the palaeontology of the Volkrust Formation in general and the Cainozoic strata of the region. Any disruption to those fossils by the proposed construction process would potentially result in permanent and irreversible damage or destruction of the fossil heritage of the area.

Issue	Nature of Impact	Extent of Impact	'No go' Areas
Damage or destruction of fossil materials	Many fossil taxa (particularly vertebrate taxa) are known from only a single fossil and, thus, any fossil material is potentially highly significant. Accordingly, the loss or damage to any single fossil can be potentially significant to the understanding of the fossil heritage of South Africa and to the understanding of the evolution of life on Earth in general. Where fossil material is present and will be directly affected by the building or construction of the projects infrastructural elements the result will potentially be the irreversible damage or destruction of the fossil(s).	Local	None
Movement of fossil materials	The fact that the fossils are not *in situ* would either significantly reduce or	Local	None

	completely destroy their scientific significance.		
Loss of access for scientific study to any fossil materials	Excavations resulting from the progress of the project would certainly expose deeper portions of the regolith horizon than are unaffected by the historical cultivation practises and possibly even the rocks of the Adelaide Subgroup	Local – Regional	None

Gaps in knowledge & recommendations for further study

» The information provided within this report was derived from a desktop study of available maps and scientific literature; no direct observation was made of the area as result of a site visit.
» A thorough site investigation will be conducted prior to commencement of the project by a palaeontologist. This would make it possible that scientifically and/or culturally significant fossils may be discovered that would be otherwise damaged, destroyed or inadvertently moved.
» It is also recommended that a close examination of all excavations be made while they are occurring.

Visual Impacts

The identified site for the proposed PV facility is situated approximately 9km by road south-east of Allanridge and 13km north-east of Odendaalsrus on the farm Hilton 30. This farm is located in an area that has a distinct rural and agricultural character, with very limited infrastructure development in the immediate surrounds of the site. Exceptions occur where power line infrastructure passes adjacent to the site, as well as smaller power lines located approximately 4km west of the site. These lines all congregate at the Grootkop substation located about 6.5km north-east of the site.

The study area for the visual assessment encompasses a geographical area of 298km^2 and includes a minimum 8km buffer zone from the proposed development area. It includes the towns of Odendaalsrus, Kutlwanong, Nyakallong (part of Allanridge) as well as sections of the R30 and R34 arterial roads and a number of major secondary (local) roads.

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 and solar panels. Potential impacts associated with these activities which have been identified during the Scoping Phase include:

» Impacts on observers travelling along the provincial and gravel roads (i.e. R30) in close proximity to the proposed facility.
» Impacts on potentially sensitive receptors i.e. farm settlements

Issue	**Issue**	**Extent**	**No go' Areas**
Potential visual impacts associated with the construction phase on observers in close	Construction of solar facility and associated infrastructure	Local	None

proximity to the facility.			
The potential visual impact of the construction of ancillary infrastructure (i.e. the substation at the facility, associated power line and access roads) on observers in close proximity of the facility.	Construction of associated infrastructure of the solar panels.	Local	None

Gaps in knowledge & recommendations for further study

» It is recommended that additional spatial analyses be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact.

The following will be undertaken during an EIA phase:

» Determine Visual Distance/Observer Proximity to the facility
» Determine Viewer Incidence/Viewer Perception
» Determine the Visual Absorption Capacity of the landscape
» Determine the Visual Impact Index

Social Impacts

The Matjhabeng Local Municipality (MLM) incorporates Welkom, Odendaalsrus, Virginia, Hennenman, Allanridge and Ventersburg with a combined population of 406 461 people based on Census 2011. The economy of the Matjhabeng Municipality area centered on mining activities located in and around Allanridge, Odendaalsrus, Welkom and Virginia. Manufacturing associated with the mining sector exists to a limited extent in the above towns. Other manufacturing activities are limited. The town of Welkom, which is the administrative seat of both the LDM and MLM, has been badly affected by the decline in the mining sector and unemployment in the town has increased in recent years. The development of renewable energy facilities, such as the proposed solar energy facility, therefore has the potential to off-set some of the job losses in the mining sector, albeit limited in extent.

Issue	Nature of Impact	Extent of Impact	No go' Areas
Potential impact on rural sense of place	Construction of solar panels and associated infrastructure	Local - Regional	None
Potential impact on farming activities and other existing land uses	Construction activities such as excavation	Local - regional	None
Potential impact on property prices, specifically adjacent properties	The construction of PV panels and associated infrastructure may reduce property values in the local area due to the visual impacts of the infrastructures.	Local	None
Potential impacts associated with influx of job seekers into the area and the presence	The typical impacts associated with the presence of construction workers include increase in sexually	Local - regional	None

of construction workers	transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community etc		
Creation of employment and business opportunities	Construction of the solar facility and associated infrastructure	Local	None
Creation of potential training and skills development opportunities for local communities and businesses	Construction of the solar facility and associated infrastructure	Local	None

Gaps in knowledge & recommendations for further study

» The identification and assessment of social impacts has been guided by the Guidelines for specialist SIA input into EIAs adopted by DEA&DP in the Western Cape in 2007. 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
  » 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 Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented; and
  » Finalisation of the SIA Report.

Table 5.2: Evaluation of potential impacts associated with the operational phase for Grootkop Solar Energy Facility

Impacts on Ecology (Flora, Fauna and Ecosystems)

As the area regarded as suitable for the development has been transformed to a large extent in the past, it is not expected that it comprises any restricted habitat for any endangered species. Protected species present on the study area can be successfully relocated if they will be affected by the proposed development. The impact is thus expected to be limited to vegetation and soil only, whilst impact on any vertebrates that may occur on site is so far assumed to be minimal or negligible.

Issue	Nature of Impact	Extent of Impact	'No go' Areas
Disturbance or loss of indigenous natural vegetation due to shading	PV panels create large areas of intensive shade that will not be tolerated by most of the species present on site, as these have evolved with a high daily irradiance. As a consequence, it can be expected that within the Solar Energy Facility footprint, species composition will change significantly. No locally representative studies or experiments have been undertaken to date, thus it cannot be predicted which and what density of vegetation may persist. The majority of indigenous grasses, having the C_4 carbon-fixing mechanism, are adapted to very high levels of irradiance. A sparser or less stable vegetation beneath the PV panels may: » Increase the magnitude of negative effects of disturbances to remaining vegetation, including erosion- and invasion risk; » Lead to a reduction in biodiversity and ecosystem resilience; » Increase habitat fragmentation (depending on location of impact); » Disturb processes maintaining biodiversity and ecosystem goods and services; or » Lead to a direct loss of ecosystem goods and services.	Local	The only "no-go" areas so far identified are confirmed wetland areas (refer to Figure 5.1); areas of potential high sensitivity relate only to the possible presence of more wetlands. Such areas will be excluded from the development.

Altered runoff patterns due to rainfall interception by PV panels and compacted areas	PV panels create large surfaces of rainfall interception, concentrating rainfall at the edges from where it flows onto the ground in larger, concentrated quantities opposed to small drops being directly absorbed by the ground or intercepted by vegetation. This may lead to a localised increase in runoff during rainfall events, which may result in accelerated erosion. Likewise, access roads and areas where soils have been compacted during construction will have a low rainfall infiltration rate, hence creating an increase in runoff. Runoff will thus have to be monitored and channelled where necessary to prevent erosion or degradation of lower-lying drainage lines and rivers beyond the development area.	Local and surroundings	The only "no-go" areas so far identified are confirmed wetland areas (refer to Figure 5.1); areas of potential high sensitivity relate only to the possible presence of more wetlands. Such areas will be excluded from the development, but may benefit from additional runoff, unless the latter is contaminated.

Gaps in knowledge & recommendations for further study

» A detailed ecological survey and assessment will be undertaken during the EIA phase
» Studies to determine which plant species can tolerate artificial high shade levels to help reduce the erosion potential of different landscapes are lacking. Predictions about altered runoff patterns and possible species composition after shading will thus be based on best knowledge available, not on facts.

Impacts on Soils, Land-Use and Agricultural Potential

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). Typical activities during the operational phase will include:

» Cleaning panels;
» Site maintenance;
» Preventive inspections.

During the long term (more than 20 years) operational life of the solar energy facility, the land used for the facility will be leased by the developer and re-zoned from an Agricultural to Special Use. Erosion is generally considered to be the most important direct negative impact on soil during the construction

and operational phase, due to the fact that it can have significant knock-on effects in terms of hydrology and agricultural land use.

Issue	Nature of impact	Extent of Impact	No go' Areas
Loss of agricultural potential	Direct occupation by panels and other infrastructure, including roads, for the duration of the project. This will take affected portions of land out of agricultural production.	Local	None identified at this stage
Long term loss of arable	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

» All the information on soils and agricultural potential in this report has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

» The EIA phase assessment will include a field investigation of soils and agricultural conditions across the site. This field investigation will be aimed at ground proofing the existing land type information and understanding the specific soil conditions on site.

Impacts on Wetlands

Several wetlands have been identified within the footprint of the proposed solar facility area and the buffer areas around it. The different types of wetlands that are expected to occur on site, or within 500m of the site boundaries, include:

» Pans;
» Hillslope seepage wetlands;
» Hillslope seepage wetlands feeding pans;
» Dams; and
» Valley bottom wetlands.

The identified wetlands, based on a desktop delineation of wetness and greenness signatures visible on Google Earth (GE) imagery supplemented by the old aerial photographs and available wetland datasets covering the site are illustrated in figure 5.3. Based on the desktop mapping, delineated wetlands within the PV Farm boundary shown in figure 5.3 cover an approximate area of 33.5ha, of a total area of 80ha (41.9%). As indicated previously all of the areas identified as possibly being wetlands will be further investigated in the field. Based on the desktop mapping, the suspected wetlands consist mostly

of hillslope seepage wetlands and pans.

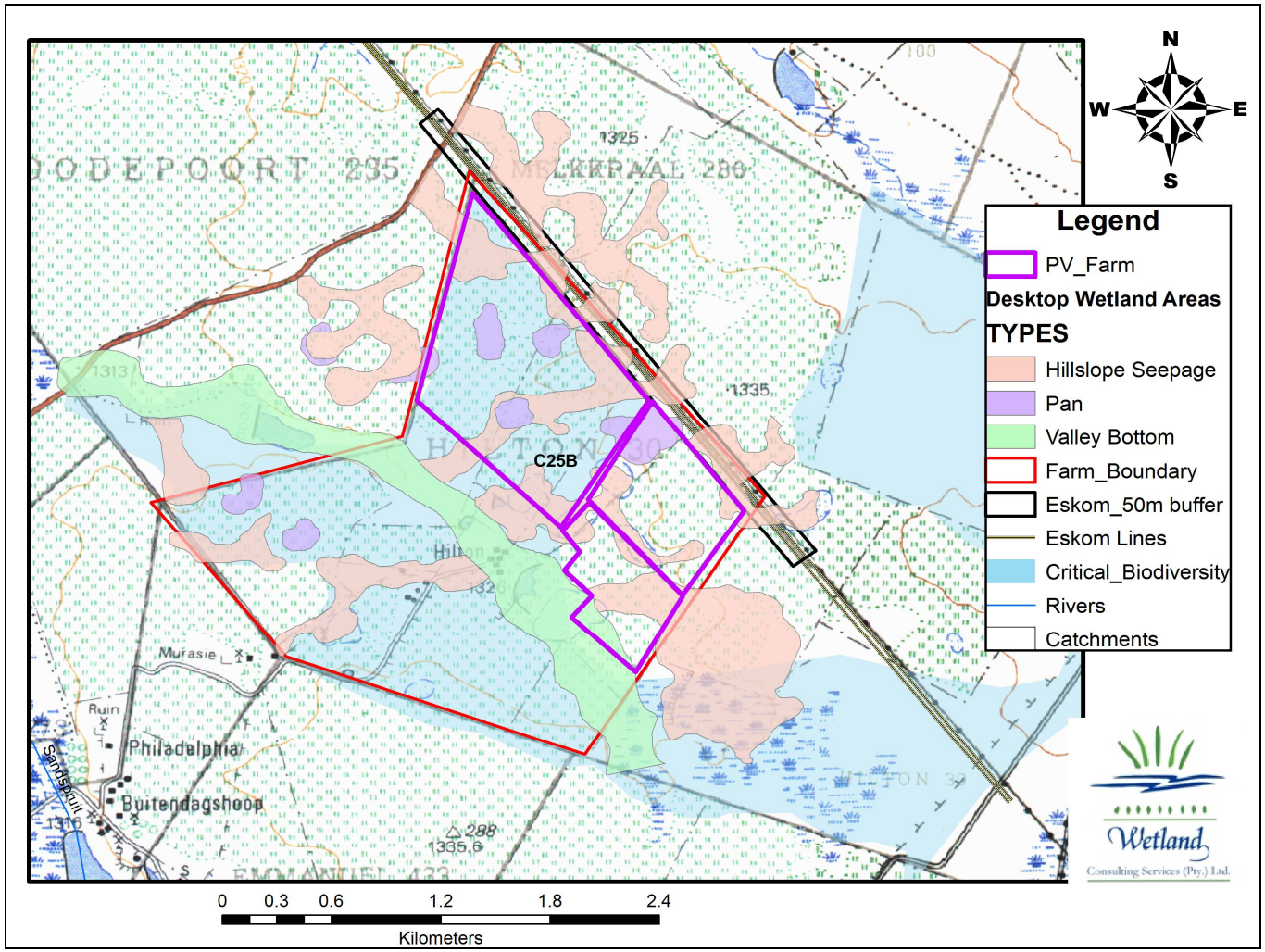

Figure 5.3: Map showing wetland areas as identified during the desktop delineation for the proposed Grootkop Solar Energy Facility

Issue	Nature of impact	Extent of Impact	No go' Areas
Erosion	Erosion at storm water discharge points associated with the	Local	Wetland areas

	proposed infrastructures on site		
Deterioration of water quality	Release of storm water into the wetlands	Local	Wetland areas
Deterioration of water quality	Due to chemically altered water entering the system (from cleaning of solar systems etc.).	Local - Regional	Wetland areas
Increase in the occurrence of alien invasive vegetation within the wetlands	Due to disturbances brought about by the proposed activities and the changes to the supporting hydrology of the wetlands	Local	Wetland area

Gaps in knowledge & recommendations for further study

The EIA phase assessment will include:

» Undertake field investigations.
» Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on agricultural resources and production.
» Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
» Assess the status of the land including erosion, vegetation and degradation.
» Describe the topography of the site.
» Do basic climate analysis and identify suitable crops and their water requirements.
» Summarise available water sources for agriculture.
» Describe historical and current land use and agricultural infrastructure on and surrounding the site, as well as possible alternative land use options.
» Determine and map the agricultural potential of the site.

Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for identified impacts.

Impacts on Heritage Resources

The topography of the area is relatively flat and is utilized for extensive agricultural purposes. Three "clusters" of buildings exist on site associated with farm houses and outbuildings. Several pans and dams are found in the eastern portion of the farm. The 132kV power line from Grootkop to Kutlwanong passes along the north eastern boundary of the site and will be used for connection into the grid.

Issue	Nature of Impact	Extent of Impact	No go' Areas
Impacts on cultural landscape and sense of place	Cultural landscapes are highly sensitive to accumulative impacts and development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act a cultural	Local	None

	landscape may also include a natural landscape of high rarity value and scientific significance.		

Gaps in knowledge & recommendations for further study

» The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area from the desk-top study undertaken is applicable to the study area.

» A detailed heritage impact assessment must be undertaken as part of the EIA phase of the process in accordance with the requirements of the National Heritage Resources Act.

» It is recommended that as part of the public consultation process, the presence of graves, archaeological and historical sites should be determined.

Visual Impacts

The result of the preliminary viewshed analyses for the proposed facility is shown on Figure 5.4. The initial viewshed analyses were undertaken from a number of vantage points within the proposed development area at an offset of 4m above average ground level (i.e. the maximum height of the PV panels). This was done in order to determine the general visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures (PV panels) associated with the facility.

It must be noted that the viewshed analyses do not include the effect of vegetation cover or existing structures on the exposure of the proposed facility, therefore signifying a worst-case scenario. It is expected that the planted vegetation cover (primarily maize) within the study area and in close proximity to the facility, will reduce the visual exposure considerably. The viewshed analyses will be refined once a preliminary and/or final layout of the facility is completed and will be regenerated for the actual position of the infrastructure on the site, and per structure position (and actual proposed technology) during the EIA phase of the project.

It is evident from the preliminary viewshed analyses that the proposed facility would have a fairly large area of potential visibility (i.e. within an 8km radius of the site), especially to the lower lying areas west of the site. This area of exposure is generally restricted to vacant farmland and agricultural fields, but may contain some potentially sensitive visual receptors. This pattern of exposure is generally attributed to the flat topography of the study area, with no hills or ridges influencing or interrupting the viewshed analysis.

Theoretical visibility within a 2km radius of the facility includes mainly vacant land or agricultural fields and a section of the secondary road traversing between Nyakallong and farms located north-east of the site.

» Visibility between the 2-4km radii includes sections of the abovementioned secondary road as well as farm residences located south-west of the site. These include: Philadelphia, Sousvlei and Weltevrede.

» Visibility subsides considerably beyond a 4km radius with only limited exposure expected to the south-west and north-west of the site. This zone includes sections of the towns of Kutlwanong, Odendaalsrus and Nyakallong. However, the built-up nature of these areas and the occurrence of built structures and associated visual clutter are expected to virtually nullify the potential visual exposure, or at the very least restrict it to the outlying areas of these towns.
» Visibility beyond 8km from the proposed development is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer.

Issue	Nature of Impact	Extent of Impact	No go' Areas
Visual exposure to solar panels and associated infrastructure	The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.	Local - Regional	None
Visual exposure to solar panels and associated infrastructure	The visibility of the facility to, and potential visual impact on, observers travelling along the major local road traversing north of the proposed facility.	Local	None
Visual exposure to solar panel and associated infrastructure	The visibility of the facility to, and visual impact on the larger built-up centres or populated places (the towns of Odendaalsrus, Kutlwanong and Nyakallong) as well as the homesteads (farm residences) located in close proximity of the site.	Local	None

Gaps in knowledge & recommendations for further study:

» It is recommended that additional spatial analyses be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact.

The following will be undertaken during an EIA phase:
» Determine Visual Distance/Observer Proximity to the facility
» Determine Viewer Incidence/Viewer Perception
» Determine the Visual Absorption Capacity of the landscape
» Determine the Visual Impact Index

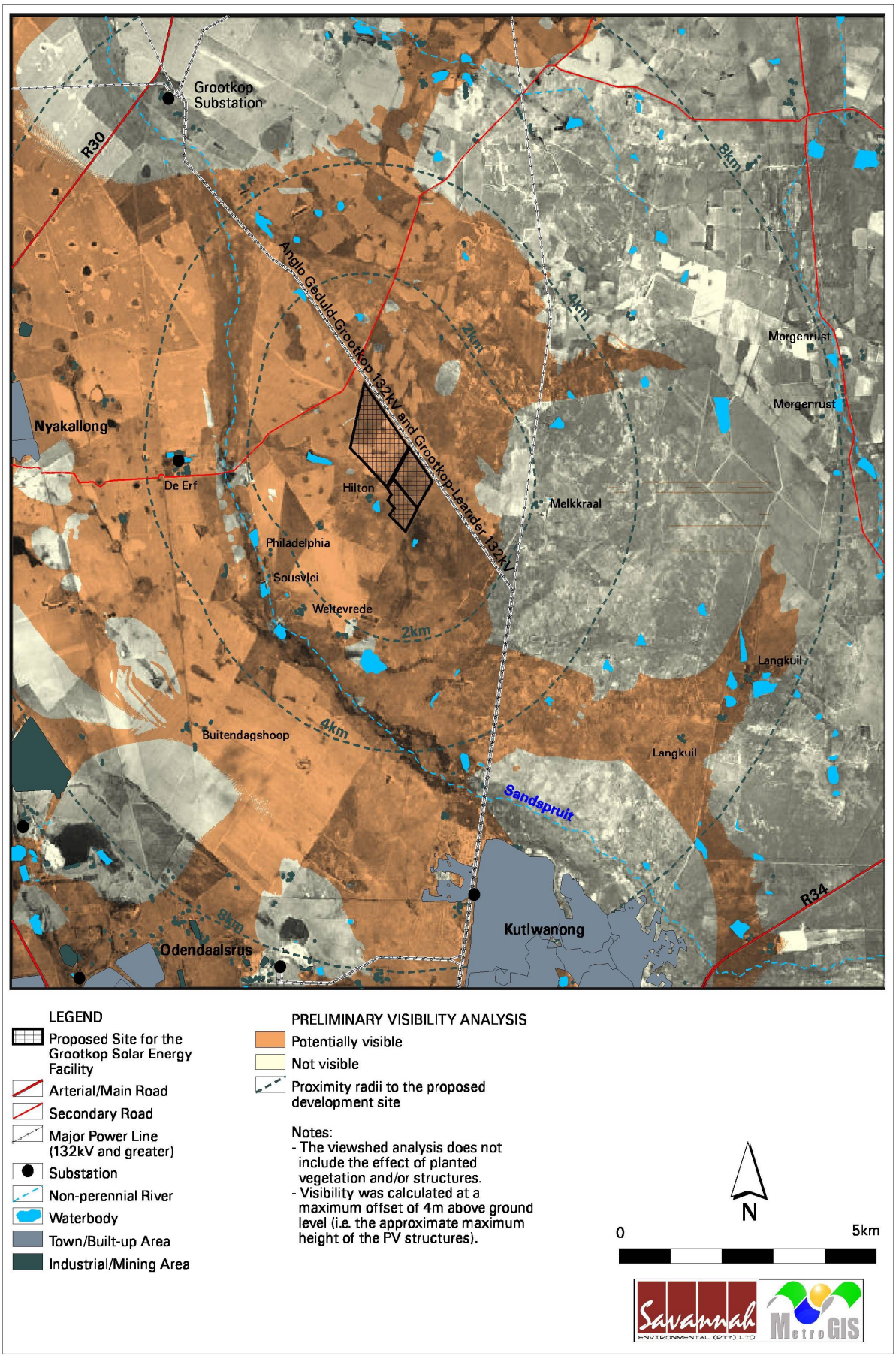

Figure 5.4: Viewshed map for the proposed Grootkop Solar Energy Facility

Social Impacts

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 and so forth). The proposed project could therefore assist in meeting the government's	National	None identified at this stage

	target for renewable energy while contributing to sustainable development in the country.		

Gaps in knowledge & recommendations for further study

» The identification and assessment of social impacts has been guided by the Guidelines for specialist SIA input into EIAs adopted by DEA&DP in the Western Cape in 2007. 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
  » 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 Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented; and
  » Finalisation of the SIA Report.

Table 5.3: Evaluation of potential impacts associated with the Power Line associated with Grootkop Solar Energy Facility

Impacts of the Power line

FRV Energy South Africa is considering the construction of a new on-site substation to evacuate the power from the facility into the Eskom grid. It is proposed to construct a loop in loop out power line from the on-site substation connecting to the existing Eskom 132kV line which traverses the farm, and which in turn connects to the Grootkop substation. The power line is linear infrastructure with impacts largely restricted to the tower footprints. Potential impacts include:

» During construction: disturbance to soil, vegetation and nearby residents due to excavations for the support structure for the 132kV power line.
» During operation of the solar energy facility, the power line could cause bird mortality (electrocution / collision) with the power line, and could result in visual impacts on the surrounding area.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Negative impact on vegetation and soil structure during construction of the power line	Excavations / stringing of the power line may disturb vegetation/ sensitive species (plants / animals)	Local	None at this stage
Disturbance (intrusion impacts) to residents / farmers living in close proximity to where the power line is being constructed.	Construction noise due to vehicles / staff constructing the power line may disturb residents / landowners.	Local	None at this stage
Operational impact: Bird mortality due to the power line collisions and electrocutions	Birds of conservation concern (Vulnerable) that could occur in the study area include the Kori Bustard, Lesser Kestrel, Bald Ibis, Cape Vulture, Ludwig's Bustard, Martial Eagle and African Grass-Owl. Potential impacts include: » Electrocution / collision of certain bird species with the power line, due to overhead cables. » Cumulative impacts due to extensive power line infrastructure in the area.	Local – Regional	None at this stage

Gaps in knowledge & recommendations for further study:

» Specialist studies for all aspects of the environment will consider the impact of the power line on the different environmental elements.
» The impact of the power line is dependent on the grid connection point which is to be agreed with Eskom.

Table 5.4: Evaluation of potential Cumulative impacts associated with the GrootkopSolar Energy Facility and other proposed projects

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 Grootkop Solar Energy Facility have been viewed from this perspectives within this report include the cumulative impacts associated with the scale of the project,

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 potential **cumulative impacts** associated with the Grootkop Solar Energy Facility at a site level are expected to be associated with the scale of the project (i.e. 75MW in total export capacity and 240hectares in total extent). The potential direct cumulative impacts associated with the project are expected

to be associated predominantly with the potential ecology impact, potential soil impacts and potential impacts on visual and social 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. Potential cumulative impacts associated with numerous solar energy facility developments within the study area are expected to be associated with:

» *Ecology* – natural vegetation within the study area is largely impacted by agricultural activities, and is formally conserved only to a limited extent. Although a solar energy facility generally results in permanent disturbance of 10% - 20% of a development site, any impacts on natural vegetation in this area are considered significant. Therefore, numerous developments (regardless of their nature) within the study area are expected to have an impact on vegetation at a regional level. However, it must be noted that this impact can be effectively avoided through the placement of infrastructure outside of natural vegetation and sensitive habitats. However cumulative habitat loss and fragmentation can be expected.
» *Soil* – The study area is known for agriculture, numerous solar energy facilities in this area could results in loss of arable land and a decrease in agricultural production.
» *Wetlands:* The area affected by the proposed development is located immediately to the south east of the town of Allanridge in the Free State province, and as such falls within the Vaal River Catchment (C), and more specifically within quaternary catchment C25B which is drained by the Sandspruit River and its tributaries. Numerous solar energy facilities could results in destruction, disturbance and contamination of wetlands.
» *Visual impacts* –The most significant impact *associated w*ith solar energy facility projects and associated infrastructure is the visual impact imposed on the scenic resources and cultural landscape of this region. A number of facilities within an area can result in impacts of higher significance in this regard.
» *Social* – The development of numerous solar energy facilities within the study area will have a cumulative impact on several existing issues within the area, predominately associated with the potential influx of workers and job seekers. With the increased population density, this may lead to a cumulative impact on housing requirements, services (i.e. water, electricity and sanitation), health issues, safety and security. New informal townships are unlikely to have the required infrastructure and services. With the existing rural settlements in the area this will have a cumulative impact on the environment and on human health (specifically in terms of sanitation services). The main social impact, however, will be in terms of visual impacts and associated impacts on sense of place.
» *Positive impacts* - Cumulative positive impacts are, however, also anticipated. The development of renewable energy facility will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the biophysical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years, as detailed in the Integrated Resource Plan (IRP).

Gaps in knowledge & recommendations for further study

» Each specialist study within the EIA Phase of the project will consider and assess the cumulative impacts associated with each aspect of the environment.

CONCLUSIONS CHAPTER 6

FRV Energy South Africa (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility as well as associated infrastructure on a site located approximately 9 km south-east of Allanridge, Free State Province. Based on a pre-feasibility analysis and site identification process undertaken by FRV, a potentially favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA).

The Grootkop Solar Energy Facility is proposed to be located on farm Hilton 30, about 9 km south-east of Allanridge, within the Matjhabeng Local Municipality of the Free State Province. A broader area of approximately 450 ha is being considered within which the facility is to be constructed. The proposed facility is proposed to have a maximum export capacity of 75 MW to be achieved through several arrays of PV panels and the following associated infrastructure:

» Mounting structures for the solar panels to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling between project components, to be lain underground where practical.
» A new on-site substation to evacuate the power from the facility into the Eskom grid
» A loop in loop out connection to the 132kV power line (which runs parallel to the farm and this connects to the Grootkop substation)
» Internal access roads and fencing.
» Associated buildings including a workshop area for maintenance and storage, and offices.

The proposed development requires a development area of approximately 240 ha, and is to be located within a broader site of approximately 450 ha. Therefore, it is expected that the facility can be appropriately placed within the broader site such that any identified environmental sensitivities and constraints can be avoided.

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

The facility is proposed to accommodate photovoltaic panels with an export capacity of up to 75 MW. In evaluating impacts associated with the proposed facility, it has been assumed that although during operation the area affected will comprise up to 240 ha (including access roads and a substation), during construction a larger portion of the approximately 450 ha could be subject to some level of disturbance.

The Final Scoping Study for the proposed Grootkop 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 Final 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 Final Scoping Report are the result of desk-top evaluations, limited on-site inspections 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 impacts identified to be associated with the proposed Grootkop Solar Energy Facility, as well as an indication of the extent of these impacts is provided in Tables 6.1 and 6.2 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.

Table 6.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Grootkop Solar Energy Facility

Construction / Decommissioning Impacts	Extent
Disturbance to and loss of indigenous natural vegetation	L
Disturbance or loss of threatened / protected plants	L
Loss of habitat for threatened and /or protected vertebrates	L
Impacts on wetlands	L
Establishment and spread of declared weeds and alien invader plants	
Land surface disturbance and alteration	L
Loss of topsoil	L
Placement of spoil material	L
Loss of wetland vegetation and habitat	L
Soil Compaction	L
Deterioration of water quality	L - R
Destruction of palaeontological landscape	L
Destruction of stone age finds: ESA, MSA, LSA,	L
Destruction of iron Age finds: EIA, MIA and LIA	L
Destruction of historical finds: periods, dumps, remains and cultural landscape	L
Destruction of living heritage i.e. rainmaking sites	L
Destruction of burial/cemeteries: over 100 and younger than 60 years	L
Damage or destruction of fossil materials	L
Damage or destruction due to movement of fossil materials	L
Loss of access for scientific study to any fossil materials	L
Potential visual impacts associated with the construction phase on observers in close proximity to the facility.	L
The potential visual impact of the construction of ancillary infrastructure (i.e. the substation at the facility, associated power line and access roads) on observers in close proximity of the facility.	L
Potential impact on rural sense of place	L - R
Potential impact on farming activities and other existing land uses	L - R

Potential impact on property prices, specifically adjacent properties	L - R
Potential impacts associated with the presence of construction workers	L - R
Potential impacts associated with the influx of job seekers into the area	L – R
Creation of employment and business opportunities	R - N
Creation of potential training and skills development opportunities for local communities and businesses	L - R

Table 6.2: Potential impacts associated with the Operational Phase with all three phases of the proposed Grootkop Solar Energy Facility

Operational Impacts	Extent
Disturbance or loss of indigenous natural vegetation due to shading	L
Altered runoff patterns due to rainfall interception by PV panels and compacted areas	L - R
Loss of agricultural potential	L -R
Long term loss of arable land and potential soil erosion.	L -R
Erosion	L
Deterioration of water quality	L - R
Increase in the occurrence of alien invasive vegetation within the wetlands	L
Indirect impacts on heritage resources	L
Impacts on cultural landscape and sense of place	L - R
Bird mortality due to power line collision and electrocutions	L - R
Visual exposure to solar panels and associated infrastructure	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 tables above, the majority of potential impacts identified to be associated with the construction of the Grootkop 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.

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

» **Vegetation:** The proposed site falls mostly within the original extent of Vaal-Vet Sandy Grassland as described by Mucina and Rutherford (2006). Most of this vegetation on the project site has been previously transformed by cultivation. The remaining extent of this vegetation type has been listed in the threatened terrestrial ecosystems for South Africa (2011) as Endangered. Outside of the proposed development area, closer to larger drainage lines and small rivers, the grassland vegetation merges into Highveld Alluvial Vegetation, which is considered as least threatened. Several protected and red-data species potentially occur on and around the site. However, it is unlikely that the development will compromise the survival of any of the species of conservation concern, provided the final layout is designed in accordance to findings of the EIA.
» **Agriculture Potential:** The area next to the proposed site for development has been used for agriculture (i.e. maize farming). These areas are sensitive as they might impact on agricultural production in the area and should not be impacted upon by proposed development.
» **Wetlands:** The proposed solar facility area is situated in the C25B catchment. In terms of receiving water resources that might be impacted by activities on site, these include the wetland areas and the major Sandspruit River that drains the entire immediate catchment area. The Sandspruit River is a tributary of the Vaal River. According to the National Freshwater Ecosystem Priority Areas data set (Nel et al., 2011), the Sandspruit River is in a moderately modified condition (PES C). In addition, a number of seasonal pans occur within and around the site. These could be of some importance in terms of biodiversity, potentially supporting pan-adapted aquatic invertebrates and associated vertebrates. The proposed site has wetlands which are sensitive and should be regarded as "no go areas" for any development activities.
» **Social receptors:** There are farm settlements or residences which occur at irregular intervals throughout the study area. Some of these are loctaed, in close proximity to the proposed development site, including: Hilton (located

on the farm itself), Philadelphia, Sousvlei, Weltevrede and Melkkraal. These residences could be impacted from a visual perspective.

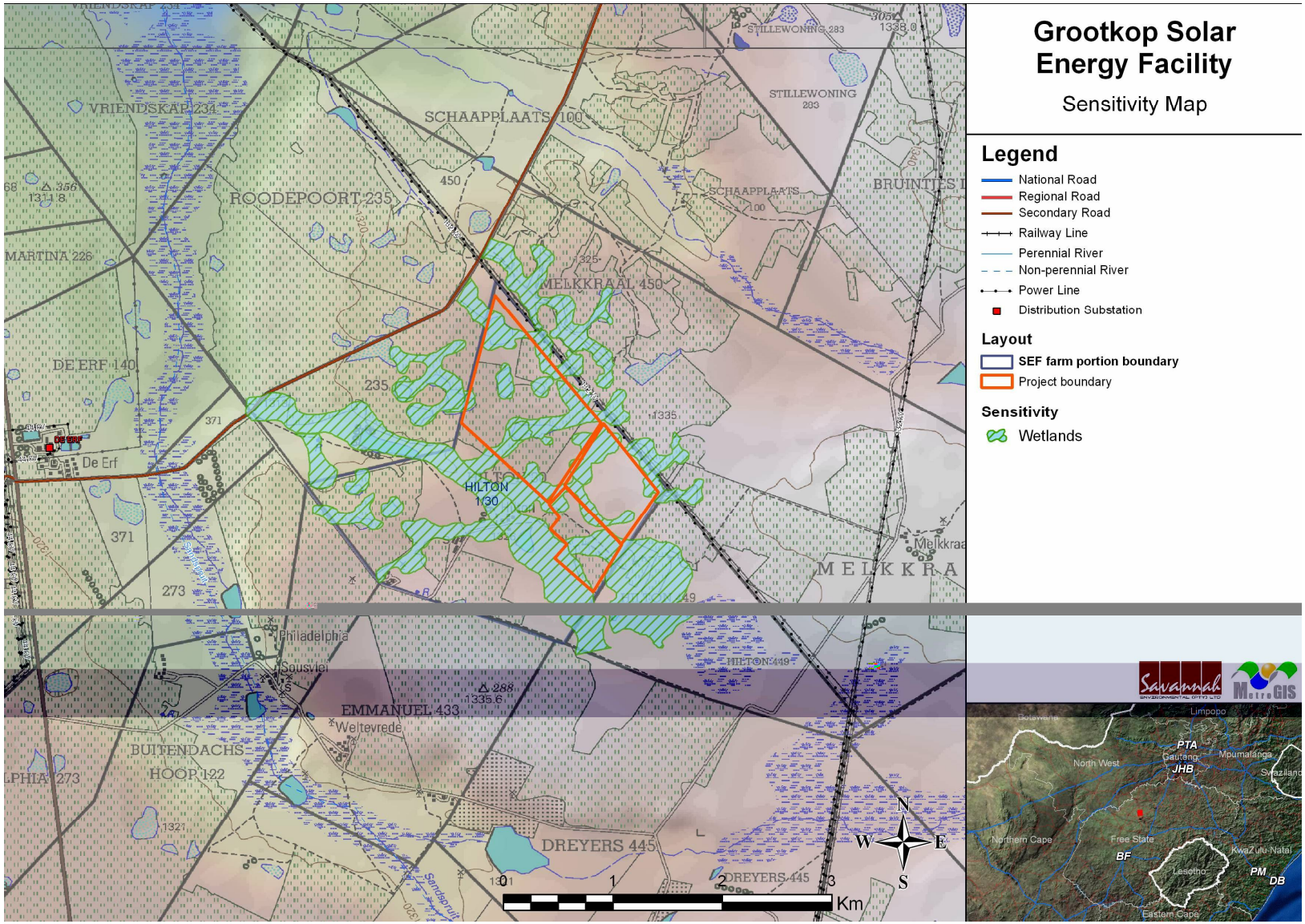

Figure 6.1: Sensitivity map for the proposed Grootkop Solar Energy

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 indicates no-go areas identified through the scoping study as well as potentially sensitive areas identified through scoping. These potentially sensitive areas will 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 sensitivity 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.

This preliminary / desktop sensitivity analysis of the site should be considered by FRV in understanding which area of the site would be least impacted by the development of the Grootkop Solar Energy Facility in order to inform the preliminary infrastructure layouts for consideration within the EIA phase. In order to assess potential impacts within sensitive areas, the preliminary layout for the solar energy facility will be considered in 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.

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

In order to connect Grootkop Solar Energy Facility to the power grid, the developer is proposing to construct an on-site substation and power line which will loop into and out of the 132kV power line which passes along the boundary of the farm, and which in turn connects to the Grootkop substation. 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 with the power line, 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.

6.3. Conclusions

At this stage, there are no fatal flaws associated with the Grootkop Solar Energy Facility proposed on farm Hilton 30. Further investigation is however required to confirm this. It is recommended that the proposed site should be considered in an EIA phase assessment according to the Plan of Study contained in this report (refer to Chapter 7).

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 7

A detailed description of the nature and extent of the proposed Grootkop Solar Energy Facility and associated infrastructure, details regarding the Scoping Phase followed, as well as the issues identified and evaluated through the Scoping phase (to date) have been included in the Draft Scoping Report. This provides the context for a Plan of Study for Environmental Impact Assessment (EIA), which is outlined within this chapter of the report.

The Plan of Study describes how the EIA Phase for the proposed project will proceed. The EIA Phase of the study includes detailed specialist studies for those impacts recorded to be of significance. The key findings of the Scoping Phase (which includes inputs from authorities, the public, the proponent and the EIA specialist team) are used to inform the Plan of Study for EIA, together with the requirements of the NEMA EIA Regulations and applicable guidelines.

7.1. The EIA Phase

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

The EIA Phase will aim to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed project
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed facility and associated infrastructure
» 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
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.

7.2. Authority Consultation

Consultation with the regulating authorities (i.e. DEA and DEDTEA) has been undertaken and will continue throughout the EIA process. On-going consultation will include the following:

» Invitation to attend a stakeholder meeting during the review period of the Draft Scoping Report.
» Submission of a Final Scoping Report following a 30-day public review period (and consideration of comments received).
» Submission of a Final Environmental Impact Assessment Report following a 30-day public review period.
» An opportunity to visit and inspect the site.

In addition, consultation with non-DEA authorities who may have jurisdiction over the project (i.e. Organs of State) will continue throughout the EIA process.

7.3. Consideration of Alternatives

The following project alternatives will be investigated in the EIA:

» **The 'do nothing' alternative:** FRV does not establish a 75 MW Solar Energy Facility south east of Allanridge (maintain status quo).
» **Site-specific alternatives:** in terms of actual infrastructure positioning on site (including access roads, substation etc).
» **Alternative technologies:** for use in the establishment of the facility.

7.4. Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

A summary of the issues which require further investigation within the EIA phase, as well as the proposed activities to be undertaken in order to assess the significance of these potential impacts is provided within Table 7.1. The specialists involved in the EIA Phase are also reflected in Table 7.1. These specialist studies will consider the site proposed for the development of the facility and all associated infrastructure (including alternatives with regards to design, layout and technology), as well as the alternative alignments of the proposed power line and access roads.

Table 7.1: Summary of the issues which require further investigation within the EIA phase and activities to be undertaken in order to assess the significance of these potential impacts

Activities to be undertaken in order to assess significance of impacts	Specialist
Impacts on Ecology	
As part of the EIA process, a detailed field survey of the vegetation will be undertaken, preferably between mid-November to April, and results will include: » A phytosociological classification of the vegetation found on the study area according to a detailed vegetation survey and TWINSPAN analysis of survey data » A corresponding description of all defined plant communities and their typical habitats, including a full species list for each plant community and a representative photographic record taken on site of each community » A map of all plant communities within the boundaries of the study area » A description of the sensitivity of each plant community, based on sensitivity criteria » A full assessment of impacts	Marianne Strohbach (Savannah Environmental)
Soils and Agricultural Potential	
The following assessments will be undertaken in the EIA phase: » Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on agricultural resources and production. » Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers). » Assess the status of the land including erosion, vegetation and degradation. » Describe the topography of the site. » Do basic climate analysis and identify suitable crops and their water requirements. » Summarise available water sources for agriculture. » Describe historical and current land use and agricultural infrastructure on and surrounding the site, as well as possible alternative land use options. » Determine and map the agricultural potential of the site. » Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for identified impacts.	Johann Lanz
Impacts on Wetland	

Activities to be undertaken in order to assess significance of impacts	Specialist
» A site visit will be undertaken to ground truth all potential wetland areas within the affected area and verify the existence and extent of all wetland areas. » Wetland boundaries will be delineated using both soil wetness indicators (mottling and gleying) and vegetation indicators according to the method prescribed in the document "*A practical field procedure for identification and delineation of wetland and riparian areas*" (DWAF, 2005). » During the site visit, information regarding impacts on, and condition of, the wetlands will be collected enabling an evaluation of both the ecological health (PES) and the ecological importance and sensitivity (EIS) of the wetlands. » Based on the information collected in the field and experience from working on other EIA and EMP processes, potential impacts will be identified and appropriate mitigation measures recommended where the impact on the wetlands ecosystems is unavoidable. » Where applicable, suitable management and monitoring measures will also be recommended and included in the specialist wetland assessment report. » The findings of the study will be collated and a wetland delineation and assessment report will be compiled, which will also include appropriate sections for inclusion in the EMP.	Bhuti Dlamini (Wetland Consulting Services (Pty) Ltd)
Impacts on heritage sites	
During the EIA phase: » A Phase 1 Archaeological Impact Assessment will be undertaken. » During this study sites of archaeological, historical or places of cultural interest must be located, identified, recorded, photographed and described. » During this study the levels of significance of recorded heritage resources must be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met.	Jaco van der Walt (Heritage Contracts Archaeological consulting cc)
Visual impacts	
The following will be undertaken during an EIA phase; » **Determine Visual Distance/Observer Proximity to the facility** In order to refine the visual exposure of the facility on surrounding areas / receptors, the principle of reduced impact over distance is	Lourens du Plessis of MetroGIS

Activities to be undertaken in order to assess significance of impacts	Specialist
applied in order to determine the core area of visual influence for the PV structures. Proximity radii for the proposed development site are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment. MetroGIS determined the proximity radii based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure). MetroGIS developed this methodology in the absence of any known and/or acceptable standards for South African solar energy facilities. The proximity radii (calculated from the boundary lines of the PV facility) are as follows: • 0 – 2km. Short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence. • 2 - 4km. Medium distance view where the structures would be easily and comfortably visible and constitute a high visual prominence. • 4 - 8km. Longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence. • Greater than 8km. Very long distance view of the facility where the facility could potentially still be visible, though not as easily recognisable. This zone constitutes a low visual prominence for the facility. » **Determine Viewer Incidence/Viewer Perception** The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of the structure is favourable to all the observers, then the visual impact would be positive. It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed facility and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when	

Activities to be undertaken in order to assess significance of impacts	Specialist
trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options. » **Determine the Visual Absorption Capacity of the landscape** This is the capacity of the receiving environment to absorb or screen the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC. 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. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low. The VAC also generally increases with distance, where discernable detail in visual characteristics of both environment and structure decreases. The digital terrain model utilised in the calculation of the visual exposure of the facility does not incorporate the potential visual absorption capacity (VAC) of the region. It is therefore necessary to determine the VAC by means of the interpretation of the natural visual characteristics, supplemented with field observations. » **Determine the Visual Impact Index** The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the severity of each impact. The above exercise should be undertaken for the core solar energy facility as well as the ancillary infrastructure, as these structures (e.g. the substation and power line) are envisaged to have varying levels of visual impact at a more localised scale. The site-specific issues (as mentioned earlier in the report) and potential sensitive visual receptors should be measured against this	

Activities to be undertaken in order to assess significance of impacts	Specialist
visual impact index and be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact, as well as suggested mitigation measures.	
Social Impact Assessment	
The key social issues that need to be assessed during the EIA Phase include: » The policy and planning related issues; and » Local and site-specific issues. 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, See Box 1); » 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 Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented; and » Finalisation of the SIA Report. **Construction phase** (Including all related infrastructure such as power lines, access roads, office and warehouse components) » Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report; » A plan of the proposed lay-out(s) of the PV cells (including an indication of the phasing sequence on the site), supporting structures and infrastructure; » Duration of the construction phase (months); » Number of people employed during the construction phase; » Breakdown of number of people employed in terms of skills categories (low skilled, semi-skilled and skilled); » Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;	Tony Barbour (Environmental Consultant and Researcher)

Activities to be undertaken in order to assess significance of impacts	Specialist
» Estimate of total capital expenditure for the construction phase; » Indication of where construction workers will be housed (on site or in nearest town?); » Opportunities for on-site skills development and training; » Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the components associated with a solar energy facility will be transported to and assembled on site; » The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required; and » Information on the nature of the agreements with the affected landowners and or communities, specifically with regard to compensation for damage to land, infrastructure etc. **Operational phase** » Estimate of operating budget per annum; » Estimate of total number of people employed; » Breakdown in terms of skills levels (see above); » Estimate of annual wage bill; » Typical activities associated with the operational phase; » Information on opportunities for skills development and training; » Typical lifespan of proposed solar energy plant; » Information on the lease / rental agreements with local landowners and or communities, specifically with regard to issues relating to compensation for damage to infrastructure and loss of livestock etc. This information is required so as to indicate how local landowners and communities stand to benefit from the project; and » Information on establishment of community trust etc.	

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 FRV Energy South Africa (Pty) Ltd has the responsibility to avoid or minimise impacts, and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed. Assessment of impacts with mitigation will be made in order to 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. An 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 plan**
- 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 process. 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 process.

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 meetings (pre-arranged and stakeholders invited to attend).
» One-on-one consultation meetings (for example with directly affected 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 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 Environmental Impact Assessment (EIA) phase of the project are outlined in the table below. These are indicative dates for the remainder of the process.

Key Milestone Activities	**Proposed programme[4]**
Public review period for Draft Scoping report	30-day public review period from 21 May 2013 – 21 June 2013
Submission of Final Scoping Report	June
Authority acceptance of the Environmental Scoping Report and Plan of Study to undertake the EIA	July
Undertake detailed specialist studies and public participation process	August
Make draft EIA Report and draft EMP available to the public, stakeholders and authorities	September
Submission of Environmental Impact Assessment Report	October
DEA review and decision-making	January 2014

[4] Indicative dates only

REFERENCES CHAPTER 8

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