

DEA REFERENCE: 14/12/16/3/3/2/731  
AGRILAND REFERENCE NUMBER: 2014\_09\_0120

**APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE  
PROPOSED CONSTRUCTION OF A PHOTOVOLTAIC SOLAR  
POWER STATION WITH ASSOCIATED INFRASTRUCTURE ON THE  
FARM BRAKFORTEIN 897 HN, BETWEEN TAUNG AND REIVILO IN  
THE NORTH WEST PROVINCE**

**BRAKFORTEIN SOLAR POWER PLANT (PTY) LTD**

**FINAL ENVIRONMENTAL IMPACT REPORT  
(FOR PUBLIC REVIEW)**

**APRIL 2015**



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**APRIL 2015**

**CEM 2014-061**



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## VISION

**The CEM aspires to be a leading and respected university-based centre for environmental management, sustainability and related fields.**

**The CEM is driven by the quest for excellence in:**

- generating and communicating cutting-edge and innovative knowledge and skills relating to environmental management;
- finding solutions for environmental and sustainability challenges;
- delivering fit-for-purpose short learning programmes;
- mentoring, coaching and fast-tracking candidate environmental professionals;
- being the service provider of choice; and
- being respected locally, regionally and internationally for its leadership role as a catalyst for change towards a more sustainable future.

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- be a quality-driven, balanced, innovative and commercially orientated service provider in the fields of:
  - knowledge generation;
  - teaching and learning; and
  - academically driven problem solving in environmental management and sustainability.
- establish and foster sustainable working relationships with:
  - colleagues of the North-West University; and
  - respected national, regional and international leaders in environmental management and related fields.
- identify and unlock prospects, whilst exceeding expectations in the quest for continually improving the way we work and engage with others;
- sustainably grow our:
  - fields of expertise;
  - skills base and acumen;
  - human and other asset value; and
  - reach and impact.
- effectively, efficiently and responsibly manage our processes in line with all applicable requirements.

CEM: Vision and Mission Rev 2013-01

## **APPROVAL**

**CLIENT:** Brakfontein Solar Power Plant (Pty) Ltd.

**PROJECT:** Application for environmental authorisation for the proposed construction of a photovoltaic solar power station with associated infrastructure on the farm Brakfontein 897 HN, between Taung and Reivilo in the North West Province

**DEA REFERENCE NUMBER:** 14/12/16/3/3/2/731

**AGRILAND REFERENCE NUMBER:** 2014\_09\_0120

**REPORT TITLE:** Final Environmental Impact Report

**REPORT STATUS:** Draft

**DATE OF REPORT:** April 2015

**ENVIRONMENTAL ASSESSMENT PRACTITIONER:** Mr Theunis Meyer, Centre for Environmental Management

**PROJECT CO-ORDINATOR:** Mr Jurie Moolman, Centre for Environmental Management

**For: Centre for Environmental  
Management  
Mr Theunis Meyer  
Senior Environmental Manager**

**For: Brakfontein Solar Power Plant  
(Pty) Ltd.  
Mr Charles Berrington**

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**ABBREVIATIONS AND ACRONYMS**

<b>Abbreviation or Acronym</b>	<b>Description</b>
AC	Alternating Current
BA	Basic Assessment
CA	Competent Authority
CAR	Civil Aviation Regulations
CCTV	Close Circuit Television
CEM	Centre for Environmental Management
DC	Direct Current
DEA	Department of Environmental Affairs
DoE	Department of Energy
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EPC	Engineering, Procurement and Construction
GN R.	Government Notice Regulation
HMI	Human Machine Interface
I&APs	Interested and Affected Parties
IPPPP	Independent Power Producers Procurement Process
mS/m	millisiemens per meter
NEMA	National Environmental Management Act (No. 107 of 1998)
NWA	National Water Act (No. 36 of 1998)

Abbreviation or Acronym	Description
NWDEDECT	North West Department of Economic Development, Environment, Conservation and Tourism
PPP	Public Participation Process
PV	Photovoltaic
RFO	Request for Offers
RTU's	Remote Telemetry Units
SAATCA	Southern African Auditor Training and Certification Association
SACNASP	South African Council for Natural Scientific Professions
SANS	South African National Standards
SCADA	Supervisory Control and Data Acquisition
TLB	Tractor Loader Backhoe

## **PART 1: REPORT**

### **1 Introduction**

#### **1.1 Project Background**

Brakfontein Solar Power Plant (Pty) Ltd. proposes to develop a 75 Megawatt (MW) solar Photovoltaic (PV) power plant, as well as associated infrastructure such as roads and a power line, at a site between the towns of Taung and Reivilo in the North West Province. It is currently engaged in the process of securing the development rights, consents and authorisations necessary to bid the project in the Department of Energy's Renewable Energy Independent Power Producer Procurement (REIPPP) Programme.

The purpose of the proposed solar energy facility is to add new capacity for generation of renewable energy to the national electricity mix, in line with government policy. The PV facility is designed to operate continuously with low maintenance for 20 years.

The development of the proposed PV facility and associated infrastructure involves activities listed in terms of the National Environmental Management Act 107 of 1998 (NEMA) that require that a full Environmental Impact Assessment (EIA) must be conducted to obtain Environmental Authorisation (EA), prior to the commencement of those activities. The proposed development will also require a water use authorisation in terms of the National Water Act 36 of 1998 (NWA).

#### **1.2 Purpose of the Document**

An EIA refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy which requires an authorisation for permission by law and which may significantly affect the environment.

The EIA includes:

- An evaluation of reasonable alternatives;
- Recommendations for appropriate mitigation measures for minimising or avoiding negative impacts;
- Measures for enhancing the positive aspects of the proposal; and
- Environmental management and monitoring arrangements.

The objective of the EIA is to provide decision-makers with relevant and objective environmental information to determine whether or not a proposal should be accepted or rejected.

The findings of an EIA are conventionally presented to stakeholders (including decision-makers) in the form of a written report, known as an Environmental Impact Report (EIR). The EIR is at the heart of the EIA process. For this reason, and given its importance as a communication tool, its preparation is perhaps the most important component of the EIA process.

The function of the EIR is to help the responsible authority in making informed decisions, the public in understanding the likely impacts of the proposal, and the proponent in managing these impacts. Spelt out in more detail, the EIR:

- Documents and communicates clearly and impartially:
  - The context of the proposed activity;
  - The probable impacts and risks associated with the proposed activity and its alternatives;
  - Measures to mitigate and manage negative impacts – and enhance benefits – associated with the proposed activity and its alternatives, and the residual significance of impacts if mitigation measures were to be implemented effectively;
  - The concerns of the interested public, authorities, and the communities affected by the proposal; and
  - The level of confidence in predicting and evaluating impacts, any gaps in knowledge and areas of uncertainty, which could substantially influence findings.
- Forms the basis for stakeholder review. For this reason, the EIR must use simple language and be easily understood.
- Forms a sound basis for informed decision-making. In this respect, the EIR should give explicit, reliable and easily understood information to guide the decision-maker. It should enable the decision-maker to decide on an action in the best interest of society and the environment and where appropriate, set relevant conditions for authorisation.

The purpose of the EIR is to provide decision-makers with an understanding of the environmental consequences of approving the project by giving them sufficient, useful and reliable information. The information provided in an EIR should assist the decision-maker by focussing on those aspects that have to be considered in reaching a decision with regards to the environment and sustainable development.

An EIR forms the basis for review by I&APs and for decision-making. It does not define whether a project is “good” or “bad”, but provides a neutral, objective assessment of the proposed project’s impacts on the environment. The EIR also provides a discussion of alternatives to the proposal that would meet the stated need for the activity, and ways to reduce the impact of the project and any alternatives by imposing mitigating measures.

The EIR also provides the point of departure for the preparation of a plan or programme to mitigate, manage and monitor environmental impacts during the implementation and operational phases of the proposed project. As such, it should give sufficient reliable information at an appropriate level of detail to enable the preparation of a sound environmental management plan or programme.

The soundness of the EIR relies heavily on the adequacy of the EIA process. If the EIA is conducted in accordance with current best practice, the preparation of the EIR becomes relatively straightforward. If, however, there is little consistence in the approach to

assessing and evaluating impacts, and considering alternatives and mitigation, the preparation of an acceptable EIR is extremely difficult.

### 1.3 Details of the Applicant

<b>Project applicant:</b>	Brakfontein Solar Power Plant (Pty) Ltd.		
<b>Business reg. No./ID. No.:</b>	Pending		
<b>Contact person:</b>	Mr Charles Berrington		
<b>Postal address:</b>	P.O. Box 2681		
<b>Postal code:</b>	8000	<b>Cell:</b>	082 440 4057
<b>Telephone:</b>	021 461 3382	<b>Fax:</b>	086 568 2737
<b>E-mail:</b>	<a href="mailto:charlie@ae-amd.co.za">charlie@ae-amd.co.za</a>		

### 1.4 Details of the Environmental Assessment Practitioner who prepared the report

*Regulation 16(1) in Government Notice Regulation (GNR) No.543, published in terms of section 24(5), read with section 44 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), requires that an applicant must appoint an Environmental Assessment Practitioner (EAP) at own cost to manage the application. Regulation 18 furthermore specifies that an EAP appointed must be independent and have expertise in conducting environmental impact assessments, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity.*

The applicant has appointed the Centre for Environmental Management (CEM), North-West University (NWU) to manage and facilitate the EIA process for the proposed development. This report was prepared by Theunis Christoffel Meyer, who is currently employed as Senior Environmental Manager at the CEM and acts as Environmental Assessment Practitioner (EAP) for this project.

<b>Project consultant/firm:</b>	Centre for Environmental Management, North West University		
<b>ID. no.:</b>	611129 5087 083		
<b>Environmental Assessment Practitioner:</b>	Mr Theunis Meyer		
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<b>Professional affiliation(s) (if any)</b>	<ul style="list-style-type: none"> <li>• South African Council for Natural Scientific Professions (400029/08)</li> <li>• Member of the IAIA and IAIA</li> <li>• Ordinary Member of the GSSA</li> </ul>		

#### 1.4.1 Expertise of EAP to carry out environmental impact procedures

Mr Meyer holds Masters Degrees in Pasture Science and Environmental Management from the Free State and North-West Universities respectively, as well as an Honours Degree in Wildlife Management from the University of Pretoria. Mr Meyer has 14 years' experience in the environmental management and environmental assessment fields and another 14 years as plant ecologist.

In terms of professional affiliation, he is registered as Professional Natural Scientist with the South African Council for Natural Scientific Professions in Ecological Science and in Environmental Science. He is also a member of the Grassland Society of Southern Africa (GSSA), the South-African chapter of the International Association of Impact Assessment (IAIAsa) and a registered Senior Environmental Management System (EMS) Auditor with the Southern African Auditor Training and Certification Association (SAATCA).

Mr Meyer has been involved in numerous EIAs throughout South Africa, conducted in terms of the Environmental Conservation Act (No. 73 of 1989) (ECA), the National Environmental Management Act (No. 107 of 1998) (NEMA) and the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA). His responsibilities in these EIAs included the facilitation of the EIA and public participation processes, the identification and assessment of environmental impacts and the development of environmental management plans and programmes.

He also co-ordinated the popular environmental law public short course at the CEM and regularly lectures on the legal EIA requirements to various audiences. These presentations cover the requirements of Section 24 of the NEMA (No. 107 of 1998), of the regulations published in GN R.543 and the activity lists published in GN R.544, GN R. 545 and GN R.546, as well as the guidelines published by Department of Environmental Affairs (DEA), Gauteng Department of Agriculture and Rural Development (GDARD) and the Western Cape Department of Environmental Affairs and Development Planning (DEADP).

As registered EMS Auditor, Mr Meyer is regularly involved in environmental legal compliance audits for clients to establish their legal non-compliances. He has also assisted a number of organizations in identifying not only environmental impacts, but also the root causes of these impacts (environmental aspects) during the development of ISO 14001 Environmental Management Systems.

A number of specialists have also been appointed to assist with specialist studies (Table 1). Of them LG du Pisani, P Birkholtz and R Terblanche are registered professional natural scientists.

**Table 1:** Specialists involved in specialist studies during the EIA Process

Specialist study	Name	Organisation
Soils and agricultural study	L.G. du Pisani	Eduplan cc
Heritage study	P. Birkholtz	PGS Heritage
Biodiversity study	R. Terblanche	Anthene Ecological cc

Specialist study	Name	Organisation
Paleontological study	G. Groenewald	PGS Heritage
Visual impact study	G. Griesel	Axis landscape Architects cc

#### 1.4.2 Independence of EAP

Neither the CEM, nor any of the specialist sub-consultants on this project are affiliated to Brakfontein PV Solar Power Plant (Pty) Ltd. The CEM also does not have any interest in secondary developments that may arise out of the authorisation of the proposed project. Furthermore, Mr Meyer and the specialist sub-consultants meet the requirements for independence as none of them has and will have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the EIA Regulations, 2010; has and will have vested interest in the proposed activity proceeding; and also has no, and will not engage in conflicting interests in the undertaking of the activity.

#### 1.5 Statement

This report was prepared in accordance with the requirements of Regulation 31 in Government Notice (GN) No. R.543, published in terms of section 24(5) of the National Environmental Management Act (NEMA) (No. 107 of 1998).

*Regulation 31(2) specifies that an environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision, and must include –*

- *details of the EAP who compiled the report (including details of the expertise of the EAP to carry out an environmental impact assessment);*
- *a detailed description of the proposed activity;*
- *a description of the need and desirability of the proposed activity;*
- *a description of the property on which the activity is to be undertaken and the location of the activity on the property,*
- *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;*
- *a description of 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;*
- *details of the public participation process conducted, including*
  - *steps undertaken in accordance with the plan of study;*
  - *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 of the EAP to those comments; and*
  - *copies of any representations, objections and comments received from registered interested and affected parties;*
- *an indication of the methodology used in determining the significance of potential environmental impacts;*
- *description and comparative assessment of all alternatives identified during the environmental impact assessment process;*
- *a summary of the findings and recommendations of any specialist report or report on a specialised process;*
- *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, including -*
  - *cumulative impacts;*
  - *the nature of the impact;*
  - *the extent and duration of the impact;*
  - *the probability of the impact occurring;*
  - *the degree to which the impact can be reversed;*
  - *the degree to which the impact may cause irreplaceable loss of resources; and*
  - *the degree to which the impact can be mitigated;*
- *a description of any assumptions, uncertainties and gaps in knowledge;*
- *an reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;*
- *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 any specialist reports and reports on specialised processes; and*
- *any specific information that may be required by the competent authority.*

I, Theunis Meyer (the undersigned) certify that the information provided in this report is to the best of my knowledge true and correct.

Signed at Potchefstroom on 21 April 2015

## 1.6 Report Structure

This Environmental Impact Report consists of 12 sections, in line with the information requirements contained in *Regulation 31 (2) of GN R. 543, which specifies that an EIA report must contain all the information that is necessary for the competent authority to consider the application and to reach a decision.*

- **Section 1** contains an introduction to the project, as well as the details of the applicant and the EAP and the specialists ;
- **Section 2** provides a detailed description of the proposed activity and alternatives;
- **Section 3** motivates the need and desirability of the proposed activity;
- **Section 4** describes the property on which the proposed activity is to be undertaken, and the environment which may be affected by the activity;
- **Section 5** provides an overview of the Public Participation Process;
- **Sections 6-8** describe and assess the environmental issues and potential impacts associated with the proposed activities;
- **Section 9** contains the Conclusion;
- **Section 10** contains the Environmental Impact Statement;
- **Section 11** contains the introduction to the Environmental Management Programme (EMPr separate to this report); and
- **Section 12** contains the Appendices to the EIA Report.

## 2 Description of the proposed activity and alternatives

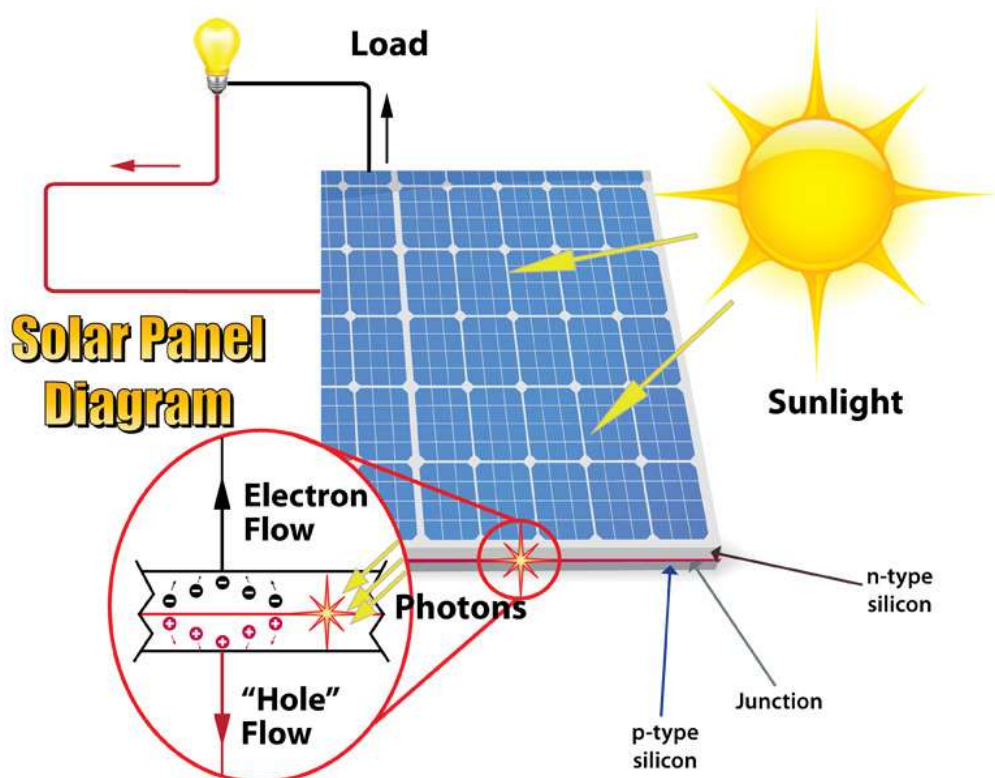
According to subsection 24(4) of the NEMA, procedures for the investigation, assessment and communication of the potential impact of activities must ensure, as a minimum, with respect to every application for an environmental authorisation, investigation of the potential impact of the activity and its alternatives on the environment and assessment of the significance of that potential impact.

Regulation 28 (1) in GN R. 543 specifies that a scoping report must contain all the information that is necessary for a proper understanding of the nature of issues identified during scoping, and must include, inter alia a description of the proposed activity and of any feasible and reasonable alternatives that have been identified.

### 2.1 Description of the proposed activity: Brakfontein Solar PV Plant

In the regulations, published in terms of section 24(5) read with section 44 of the NEMA (No. 107 of 1998) in GN R.543, "activity" is defined as an activity identified in any notice published by the Minister or MEC in terms of section 24D(1 )(a) of the Act.

Photovoltaic technology (Figure 1) involves the conversion of sunlight into electricity through the use of thin layers of materials known as semi-conductors, which absorb solar radiation that energizes their electrons to produce static electricity, which is then converted into direct current (DC) electricity. The physical processes involved in the conversion of sunlight into electricity include light absorption, electron transport and recombination mechanisms, which are determined by the electro-optical properties of the silicon material.



**Figure 1:** Schematic diagram illustrating the photovoltaic technology.

Individual PV cells are made of a semiconductor material (such as silicone), linked and placed behind a protective glass sheet to form a PV panel. A single cell is sufficient to power a small device such as an emergency telephone, however to produce 75 MW, the proposed plant will require numerous panels arranged in multiple/arrays. The angle at which the panels are positioned is dependent on the latitude of the proposed PV plant and will be adjusted to optimize for summer or winter solar radiation characteristics.

The proposed PV plant will convert the incident solar energy into direct current (DC) electricity by means of photovoltaic modules. The electricity is transferred to DC/AC inverters to convert it to alternating current (AC). The inverters will be matched to the selected PV module technology, and in turn connected to a step-up transformer in order to raise the voltage up to the grid requirements.

### **2.1.1 Description of infrastructure and facilities**

Photovoltaic power plants have a wide range of technologies that can be considered for incorporation into the plant. The solar PV industry is furthermore a rapidly developing industry, where the advances in the general efficiencies of the technology and the reduction of production costs are such that it would not be feasible to commit to specific technologies and equipment manufacturers at this stage of the project. During the bid process the developer will request credible EPC Contractors to submit proposals with respect to the technology to be used and possible equipment suppliers for the PV plant. These will include the PV module manufacturer, the capacity of the modules, the support structure or tracker type, and manufacturer, the inverter type, etc.

The Engineering, Procurement and Construction will be carried out by an EPC Contractor in accordance with good engineering practice, with due diligence, care and professionalism. The final design of the facility and the selection of equipment will be tailored for the specific site conditions. The aim of the design and lay-out of the facility will be to maximise electricity generation through exposure to solar radiation, while minimising infrastructure, operational and maintenance costs, as well as environmental and social impacts. Therefore the project description will be in generic terms and will not specify specific infrastructure brands and capacities.

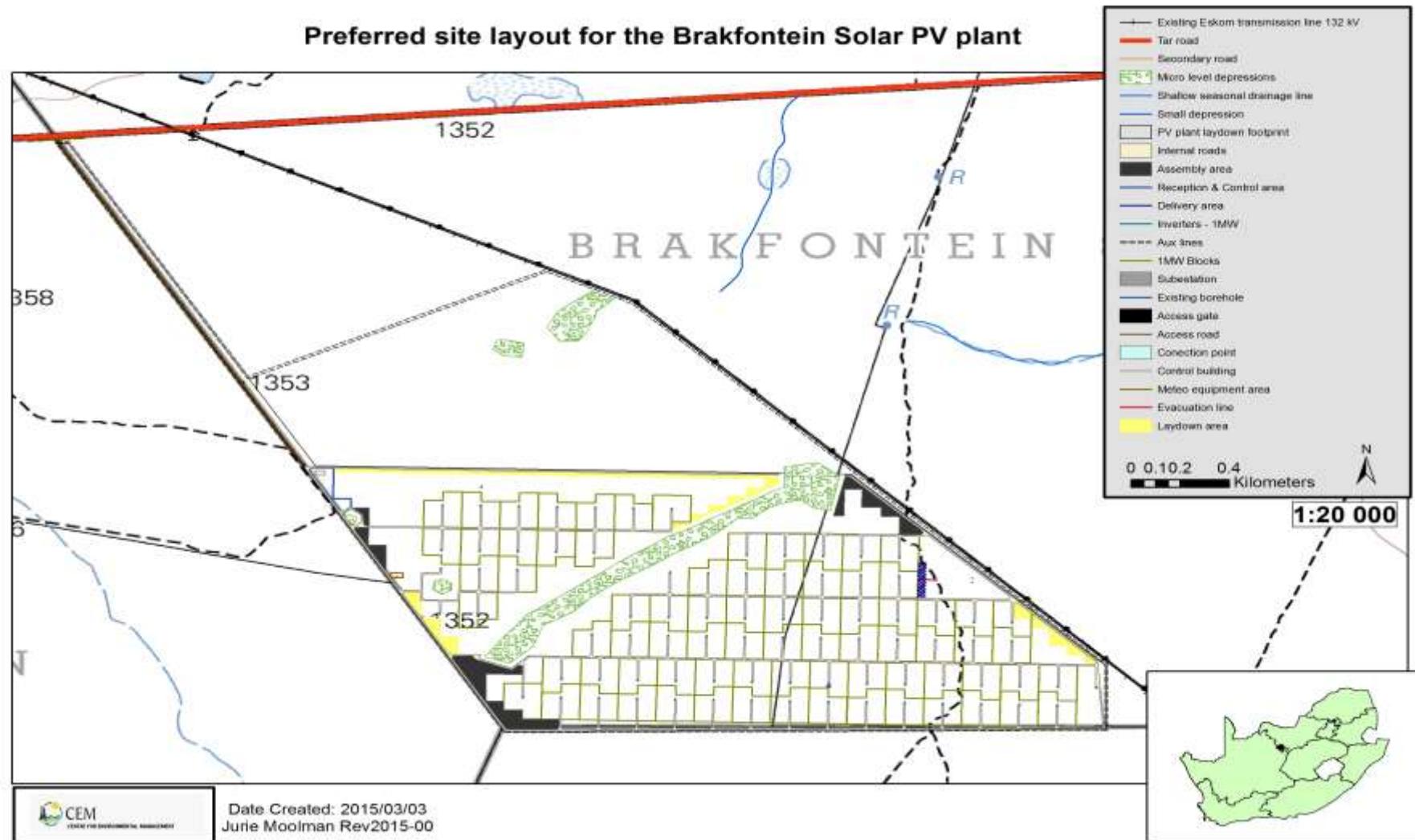
Despite the limitations above, the components of a PV power plant is known and will be discussed below. The impacts of these components will also be identified and assessed during the EIA process.

The proposed PV power plant will consist of the following infrastructure (Figure 2 and Table 2):

- Arrays of photovoltaic panels for the generation of electricity;
- Dedicated inverters to convert the electricity from DC to AC;
- Concentrator boxes;
- Transformation centre;
- Electrical reticulation, consisting of underground cabling between the photovoltaic panels and dedicated inverters;

- An overhead 132 kV power line connecting into the proposed constructed substation;
- A new sub-station will be constructed as part of the project. In a loop-in-loop-out connection, a switching sub-station is either integrated into the distribution centre part of the facility or established close to the existing power lines.
- Evacuation line;
- Trenches.
- Administrative/security buildings;
- Buildings and services (Control room, small office and workshop);
- Parking area;
- Perimeter fencing;
- Security system;
- Internal and perimeter service roads of 3 m surface width and 5 m reserve width and a main access road of 10 m reserve width;
- Meteorological stations;
- Storm water drainage systems;
- Lightning protection system;
- Auxiliary supply;
- Emergency power supply; and
- Monitoring and control systems

Table 2 summarises the technical details for the proposed facility.



**Figure 2:** Preferred technical design site layout with associated infrastructure of the proposed solar PV plant on the farm Brakfontein 897 HN.

**Table 2:** Summary of technical details for the proposed facility

Component	Description/Dimensions	
Height of PV panels	3.5	m
Area of PV Array	185	Ha
Number of inverters	75	
Area occupied by inverters/ transformer stations/ substations	1.2	Ha
Inverters/ transformer stations	0.2	Ha
Substation	1	Ha
Capacity of on-site substation	75	MW
Area occupied by both permanent and construction laydown areas	15.7	Ha
Reception and control area	1.2	Ha
Laydown areas	7.5	Ha
Assembly areas	7	Ha
Area occupied by buildings	1.15	Ha
Reception and control buildings	0.15	Ha
Substation	1	Ha
Length of internal roads	22000	m
Width of internal roads	6	m
Proximity of grid connection	160	m
Height of fencing	2.4	m
Type of fencing	Multi-strand electric fence	

#### 2.1.1.1 PV modules

There are various types of PV modules defined according to the materials used:

- Si-Monocrystalline;
- Si-Polycrystalline;
- Thin Film and;
- High Concentrated.

There is a requirement in the REIPPP programme to use only technology with a proven track record at utility scale, so Thin Film technology does not yet qualify. Currently the trend for utility scale facilities such as this is towards polycrystalline module technology.

There are also a wide range of PV module manufacturers in the market. Local content is an important bid criterion in the REIPPP programme and the use of locally manufactured or assembled PV modules are preferred to help the local economy, local job creation and local communities.

#### 2.1.1.2 Structures

In order to support the PV modules, a steel structure must be used. There are different options that will be considered:

- a fixed or rack structure,
- a 1-axis tracker (horizontal, vertical or polar axis) and



- a 2-axis tracker.

The current trend is towards rack structures or possibly horizontal single axis trackers because of the superior production rates and cost effectiveness.

There are numerous rack and tracker manufacturers in the market and the system chosen will depend on the proposals by the EPC contractors. The materials commonly used in support and tracker structures are galvanized steel, stainless steel or anodized aluminium

#### **2.1.1.2.1 Fixed or track structures**

A typical rack or fixed structure (Figure 3) will usually have two rows of 20 modules (2 strings). The modules are placed in portrait arrangement. The foundation technology is usually a direct-driven (rammed) installation, with a ramming depth subject to the soil characteristics.



**Figure 3:** A typically rack or fixed structure.

The design of the fittings for fixing the modules to the rack structures will enable thermal expansion of the metal without transferring mechanical loads that could affect the integrity of the modules. The structure will probably have anti-theft bolts.

#### **2.1.1.2.2 Single-Axis tracker**

With a typical horizontal single-axis tracker the PV modules are attached to beams on the rotating structure. A number of these trackers are placed adjacent to each other and driven by a common rotation mechanism. This allows for a modular design with each module

having a single central motor and a number of trackers. This simplifies design and allows for an extremely efficient use of space.

The system produces more output than rack structures yet still has extremely low energy consumption. Precision electronics with GPS input and proprietary positioning algorithms ensure optimum angle is controlled at all times.

#### **2.1.1.3 Foundations**

Depending on the structure or tracker that is selected, the following foundation options may be considered.

- Mass concrete block foundation;
- Ground screw foundation;
- Concrete pile foundation and;
- Vibratory driven steel pile foundation.

For fixed or rack structures, either driven steel piles or small concrete footings are cast in the ground for the foundations. These concrete foundations are typically of the same size as for small buildings.

The preferred technology for trackers is the vibratory driven steel pile foundation, however given the hard ground conditions expected on the site; a steel pile in concrete in a pre-drilled hole is the more likely foundation solution. Depending on the ground conditions a concrete pile might need to be used. A detailed geotechnical study will be carried out in order to provide data for the selection of the foundation.

#### **2.1.1.4 Electrical reticulation**

The electrical reticulation will comprise of a DC component from the PV modules to the inverters and an AC component from the inverters to the Eskom connection.

The electrical reticulation within the PV plant, from the trackers or racks through to the distribution centre will all be underground. Because trenching is likely to be costly, given the amount of shallow rock on the site, a number of alternatives focused on reducing the amount of trenching will be investigated. Possibilities are suspending all the electrical cables associated with a tracker underneath the tracker, either loosely, in bundles or in cable trays or refining the solar field layout to reduce the trench lengths.

#### **2.1.1.5 Trenches**

Trenches are usually excavated by a tractor loader backhoe (TLB), but given the quantity of trenching within the PV plant, specialist trenching machines might be used.

Depending on the number of cables that run in each trench and the voltage level, the dimensions of the trenches can vary. The typical width is 0.6 m and depth is 1.10 m. The cable or cables are laid in a suitable bedding material, usually sand. If the in-situ material is not suitable for bedding, then bedding material will be sourced from local commercial sources. The trenches are then backfilled using suitable material that came from the trench excavations.

Because trenching is likely to be costly, given the amount of shallow rock on the site, a number of alternatives focused on reducing the amount of trenching will be investigated.

#### **2.1.1.6 Concentrator boxes**

The concentrator boxes are outdoor switchgear boxes or cabinets where the electrical wires from the tracker or rack group are collected. The concentrator boxes are designed for outdoor conditions and are mounted on a concrete base.

#### **2.1.1.7 Transformation centre**

The transformation centre will be a concrete or steel prefabricated structure built to house the transformer and the associated protection devices. In the transformer, voltage level will be transformed from 0.38 kV to 132 kV.

#### **2.1.1.8 Distribution centre**

The distribution centre is where all the medium voltage lines coming from the various transformers are collected. The distribution centre is housed in a pre-fabricated or a steel structure and a MV line runs from here to the Eskom substation.

#### **2.1.1.9 Auxiliary power supply**

The PV plant requires a continuous power supply for the plant monitoring and control systems, the perimeter and security systems, lights and air-conditioning etc. for the buildings. If trackers are used, a small power supply is also required for the operation for the trackers.

The most cost effective and efficient source for the auxiliary power supply is usually directly from the Eskom substation.

#### **2.1.1.10 Emergency power supply**

In order to ensure the continuous operation of the monitoring and security systems, a backup diesel generator system, with at least 2 hours of autonomy, may be installed.

#### **2.1.1.11 New sub-station and evacuation line**

A new sub-station will be constructed as part of the project. In a loop-in-loop-out connection, a switching sub-station is either integrated into the distribution centre part of the facility or established close to the existing power lines.

The electricity from the PV power plant will be evacuated via a 132 kV overhead line to the Eskom grid. The evacuation line will be a loop-in-loop-out connection to Eskom's Pering to Ganspan 132 kV line that runs on the north and eastern sides of the site.

The connection point for the evacuation line will be determined by the Eskom grid connection requirements and the line will be designed and built to Eskom's standards. The alignment of the evacuation line will be determined by the proposed grid connection point and any environmental sensitivity between the PV power plant and the grid connection point.

#### **2.1.1.12 Site drainage**

The site currently drains naturally via a micro depression which occurs in the centre of the proposed development site. The intent of a surface managed storm water system is to facilitate the natural drainage and avoid flow concentrations and ponding. The proposed drainage system will be a surface management system based on not collecting storm-water,

but rather spreading or distributing it over the site to soak away or drain slowly similarly to the normal pre-development flows (Figure 2). This will be achieved by minor earthworks and infrastructure, but mostly by sensitive planning and incorporating the micro depressions which occurs naturally. This avoids soil erosion and downstream flooding problems normally associated with the concentrated flows.

The detail drainage and storm water surface management design will be done during the detail planning stage.

#### **2.1.1.13 Access and internal roads**

Access to the site will be from the R372 via a new gravel road to be constructed down the western side of the property. Passing bays will be provided at strategic points on the access road to allow the circulation of two trucks in opposite directions at the same time during the construction and operational phases.

The access off the R372 will be designed and built to the Road Authority's standards. The Road Authority's consent will be sought during the permitting process and construction will only commence once the detail design and specifications have been approved by the Road Authority. Sufficient space will be allowed at the access points to ensure that the vehicles do not stack up on the road while being processed through security. The road alignment and layout will also take the necessary safety precautions into account.

During the operational phase access around the site is generally only required for security and routine inspection purposes. The internal road layout will be designed in order to ensure ease of access to every rack or tracker structure and the horizontal geometry will be designed to enable the turning of trucks to provide access for cleaning operations or maintenance.

The access and internal roads will be constructed gravel roads, 3m wide with wide, open side drains forming part of the drainage system. The roads will be built with a minimum of 400mm depth of sub-grade preparation and a compacted aggregate base layer of up to 150mm thick. The base layer will either be of material obtained from the excavations on site or aggregate from a commercial source. If the material is suitable, material from the trenching or earthworks associated with the roads, storm water system, solar field and building construction will be used for road construction.

Depending on the available road building material used to build the roads and the amount of resultant dust during the operational phase, dust palliatives of surfacing will be investigated at that stage.

#### **2.1.1.14 Parking area**

There will be a small hardstand parking / lay-down area near the buildings, to be used during the operational phase.

#### **2.1.1.15 Site buildings and services**

The buildings and facilities needed to service a PV plant include a control room (20 m<sup>2</sup>) (for the security personnel), a small office (20 m<sup>2</sup>), ablution facilities and kitchen area (20 m<sup>2</sup>), a small workshop (40 m<sup>2</sup>) and a store of 300 to 400 m<sup>2</sup>. In the proposed PV plant layout,

space for the buildings is allocated near the entrance to the site. There will be no accommodation facilities on-site.

One option for the buildings and facilities is to construct a farm type shed of approximately 480 m<sup>2</sup> (40 m x 12 m), with the control room and offices etc. inside the building. However, given the fact that the electricity generating license is only awarded for a 20 year term, it is likely that temporary buildings such as park-homes or containers will be provided.

The following services will be provided for the buildings:

- Electricity will be provided from the new sub-station that will be constructed.
- The control room and the office will have air-conditioning
- Enviro-loo toilets will be used. These toilets are used in a number of National Parks and Nature Reserves and do not require a water supply. The toilets operate by separating the solid and water waste and then drying the waste by evaporation. The dry solids are removed and can safely be spread as compost in the field.
- The source for the small amount of potable water required for use by the site personnel will need to be determined during the planning process. The water will most probably be sourced from a borehole. Should the available water need treatment then the appropriate equipment will be used. If the water is sourced from a borehole for industrial purposes, it may trigger an application for a water authorisation.

#### **2.1.1.16 Security system**

The perimeter, access points and site will be monitored by closed circuit television (CCTV) cameras with infrared/night vision technology and passive intrusion detection systems. The security lighting will be linked to the passive intrusion detection systems, so that it will not be on all night.

#### **2.1.1.17 Perimeter fencing**

The proposed perimeter fence will either be a 2.4 m weld-mesh or wire and netting fence that is electrified or a double barrier consisting of two 2.4 m high electric fences with only electric strands placed about two or more metres apart. The electrification will be non-lethal. A single 6 m automated sliding gate will be provided for vehicular access, as well as a single 1 m wide gate for pedestrians.

Given the high material value of the solar field material, especially the cables and PV modules, and the risk of theft, it is imperative that the perimeter fences and security systems are installed and commissioned with the initial site establishment activities, so that there is a secure enclosed site prior to the high value materials arriving on site. The process will be to first fence off a delivery, storage and processing area within the site as a start and then to erect the perimeter fence and security, restricting the movement of site personnel to the actual construction site.

#### **2.1.1.18 Lightning protection system**

To protect the PV plant, equipment and personnel from lightning strikes, a lightning protection system composed of masts and surge arresters will be installed. This system will be designed by a specialist and will comply with the South African laws and standards.

Although current lightening protection designs only allow for low height protection on the individual structures, provision has been made in the applications for 15m high conductor masts.

#### **2.1.1.19 Monitoring & control systems**

A Supervisory Control and Data Acquisition (SCADA) system will be installed to monitor, control and alarm plant or regional operating systems from a central location.

There are to a SCADA system consists of three main elements: various remote telemetry units (RTU's), communications and a human machine interface (HMI). Each RTU effectively collects information at a site, such as from the inverters or met station. Communications transmit that information from the various plant or regional RTU sites to a central location, and occasionally return instructions to the RTU. Communication within a plant will be by data cable, wire or fibre-optic, while regional systems most commonly utilize radio or the internet. The HMI is essentially a PC system running powerful graphic and alarm software programs and displays the information in an easily understood graphics form, archives the data received, transmits alarms and permits operator control as required. The real time information can be monitored remotely, typically by the O&M Company and the plant owners etc.

#### **2.1.1.20 Meteorological stations**

There will be a number of meteorological stations installed on the site in order provide adequate meteorological data to evaluate the PV plant performance. The typical meteorological station will include all or some of the following elements:

- A 3 m high lattice structure for the support of the systems;
- Pyranometer for tilted radiation and a horizontal pyranometer for global radiation;
- Ambient temperature sensor with natural ventilation anti-radiant shield;
- Anemometer at 5 m height;
- A vane to measure the wind direction;
- Temperature sensor module;
- Humidity sensor;
- Data logger;
- GSM/GPRS modem and;
- UPS or non-stop power supply system.

An example of a typical Solar PV plant layout is depicted in Figure 4





**Figure 4:** Example of a typical solar PV plant site layout.



## **2.2 Description of feasible and reasonable alternatives identified**

### **2.2.1 No-go alternative**

In considering this alternative, it must be noted that the *status quo* will be maintained, i.e. no solar PV plant facility will be constructed on the proposed site.

If the proposed solar PV plant is not constructed, there will be no environmental impacts on the Brakfontein site, albeit negative or positive environmental impacts.

It must also be noted that in the case where the development is not constructed, no positive economic (job creation) or social impacts (social upliftment) will emanate and there will be no contribution to service infrastructure development and maintenance in the Taung and Reivilo area.

Lastly, if the PV facility is not constructed no benefit for society in general will be made by alleviating the pressure of electricity generation from coal, no contributing to the government's target for renewable energy and there will be no reduction in the harmful environmental consequences from generating electricity from coal

### **2.2.2 Site alternatives**

The ideal PV plant site meets the following criteria:

- High solar irradiation area to allow for the maximisation of the solar energy received;
- Flat to gently sloped terrain to allow for the optimisation of the layouts and minimum interference with respect to shadows etc. between the individual trackers;
- Northern orientation or no obstructions to the north to allow for efficiency;
- Not on high potential agricultural land to avoid conflicts with competing activities and the national priority of food security;
- Not in environmentally sensitive areas e.g. in wetlands or in close proximity to water courses, biodiversity, heritage or palaeontological features;
- Suitable soil conditions to ensure the stability of the structures and reduce construction costs;
- Adjacent to an existing sub-station on the grid to avoid the necessity of transmission infrastructure;
- Existing capacity at the sub-station and local grid to receive the generated electricity so the electricity generated by the plant can be used locally from the time of commissioning, thus avoiding infrastructure costs and transmission losses and costs; and
- Potential to expand the facility - about the sub-station having a reasonable demand growth and there being space for the expansion of the PV plant.

The site selection process was based on locating sites that matched as many as possible of the ideal criteria for the development of a PV electricity generation plant. The selection criteria filtered out alternative sites which are in some way or another not suitable for the development of a PV facility that is environmentally and economically sustainable. This resulted in the current site being selected, first on a regional level and thereafter on a farm level.

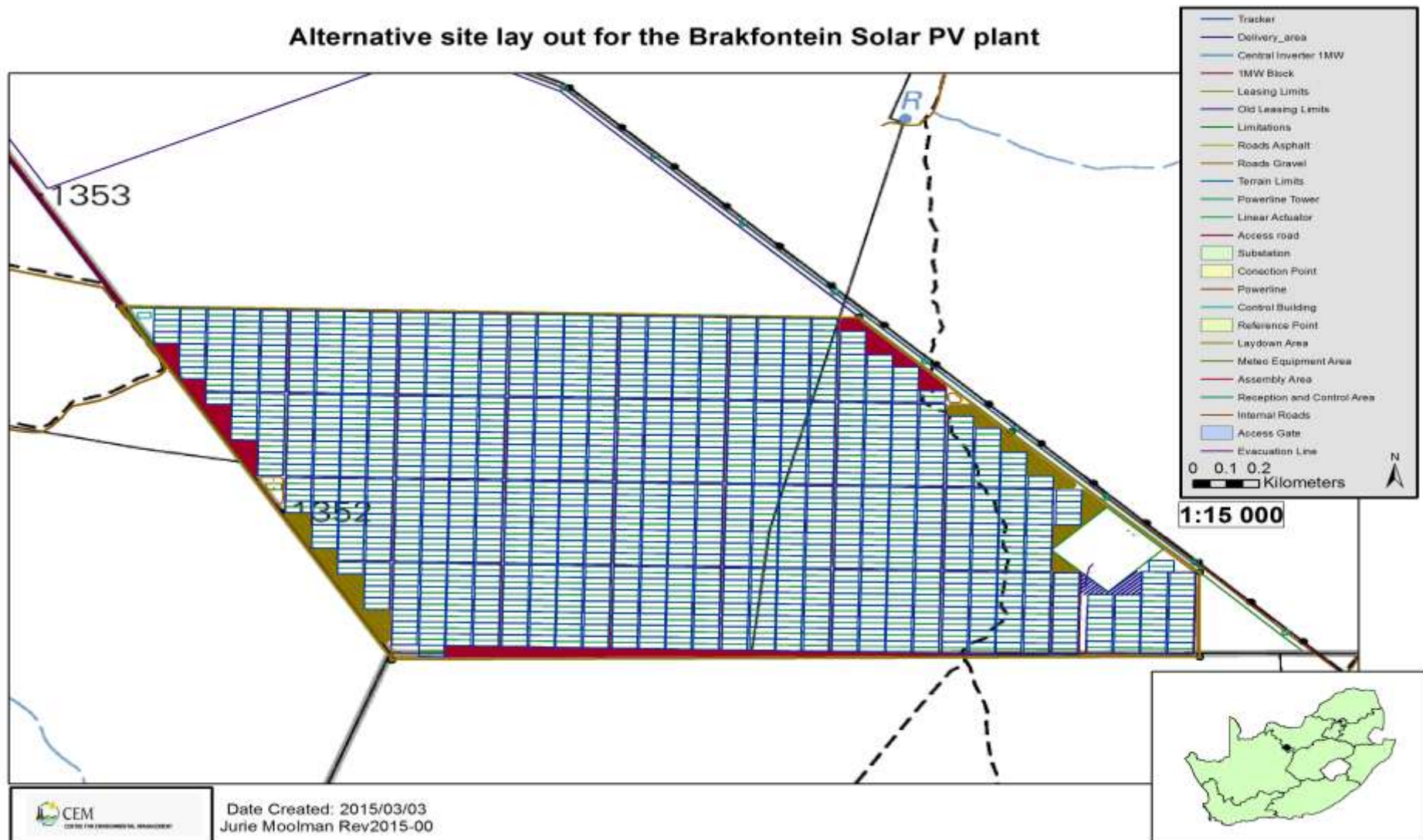
A possible alternative site was also investigated at Lykso sub-station, just off the N14 road between Vryburg and Kuruman. This specific alternative was, however, abandoned, because there was no capacity in the Eskom grid for a large PV facility (75MW) and grid upgrading plans had been shelved.

### **2.2.3 Site lay-out alternatives**

The area required for the development of a PV plant is normally determined by a number of factors. Given that this site is mostly flat, with a northern orientation, the key factors determining the size of the site needed are the production capacity of the proposed PV power plant and the technology used.

The density of development is highest for fixed rack systems and lowest if two axis trackers are used. Typically fixed rack systems would take up about two to three ha/MW and a PV plant using trackers would need approximately 4.5 to six ha/MW. The current trend in the highly competitive Independent Power Producer market implies that either fixed structures or horizontal single axis tracking systems will most likely be used. Thus the 75 MW plant could use about 250 hectares.

For purposes of the EIA it was decided to investigate a larger area than required for the PV plant envisaged in the application. This is done in order to provide for sufficient space for the preferred technology and incorporating the natural features to optimise surface water drainage and to minimise the impact modification of hydrology (Figure 5). Furthermore, to provide for flexibility in the positioning and detail layout of the power plant in response to on site or environmental conditions or for design optimisation. In such a way, the design could be modified to prevent and/or mitigate potential significant environmental impacts through a modified site-layout.



**Figure 5:** Alternative site layout of the Brakfontein Solar PV Plant not incorporating the micro depressions for natural drainage.  
CEM 2014-061

#### **2.2.4 Technological and structural alternatives**

As mentioned in Section 2.1.1, the selection of equipment and the design of the facility will be tailored for the specific site conditions to maximise electricity generation through exposure to solar radiation, while minimising infrastructure, operational and maintenance costs, as well as environmental and social impacts.

### **3 Need and desirability of the proposed activity**

#### **3.1 Need for the Brakfontein Solar PV Plant**

South Africa is a developing country where the energy demand is ever increasing. Because it is well-endowed with coal resources; the country relies heavily on coal to meet its energy needs. South Africa has developed an efficient, large-scale, coal-based power generation system that provides low-cost electricity, through a grid system that is being extended to rural areas, to millions of residential, commercial and institutional consumers.

South Africa recognises that the emissions of greenhouse gases, such as carbon dioxide from the use of fossil fuels such as coal and petroleum products has led to increasing concerns worldwide about global climate change. Although coal is likely to remain, from a financial viewpoint, an attractive source of energy for South Africa, the South African Government is committed to make due contribution to the global effort to mitigate greenhouse gas emissions. For this purpose, the Government has developed an enabling environment through the introduction of fiscal and financial support mechanisms, within an appropriate legal and regulatory framework, to allow renewable energy technologies to compete with fossil-based technologies, so that the renewable energy industry can operate, grow, and contribute positively to the South African economy and to the global environment.

South Africa is well endowed with abundant renewable energy resources that can be converted to productive energy uses and serve as sustainable alternatives to fossil fuels. It experiences some of the highest levels of solar radiation in the World. It has a considerable solar resource potential for solar water heating applications, solar photovoltaic and solar thermal power generation. Due to the fact that the utilisation of these resources have in the past not been cost competitive in many locations, when compared to South Africa's fossil-based energy supply industry, these resources have remained largely untapped.

#### **3.2 The National Development Plan**

The National Development Plan 2030 formulated certain principles to guide *'the transition to an environmentally sustainable low-carbon economy, moving from policy to process to action'*. The Brakfontein Solar PV Plant meets these principles in being just, sustainable, ethical, least regret, taking a regional approach, being accountable and transparent.

The North West Province, including the Taung area, has great potential to generate electricity from solar energy and the proposed project will contribute significantly to achieving government's objectives in this regard.

##### **3.2.1 The DEA National Strategic Environmental Assessment for the efficient and effective rollout of wind and solar photovoltaic energy**

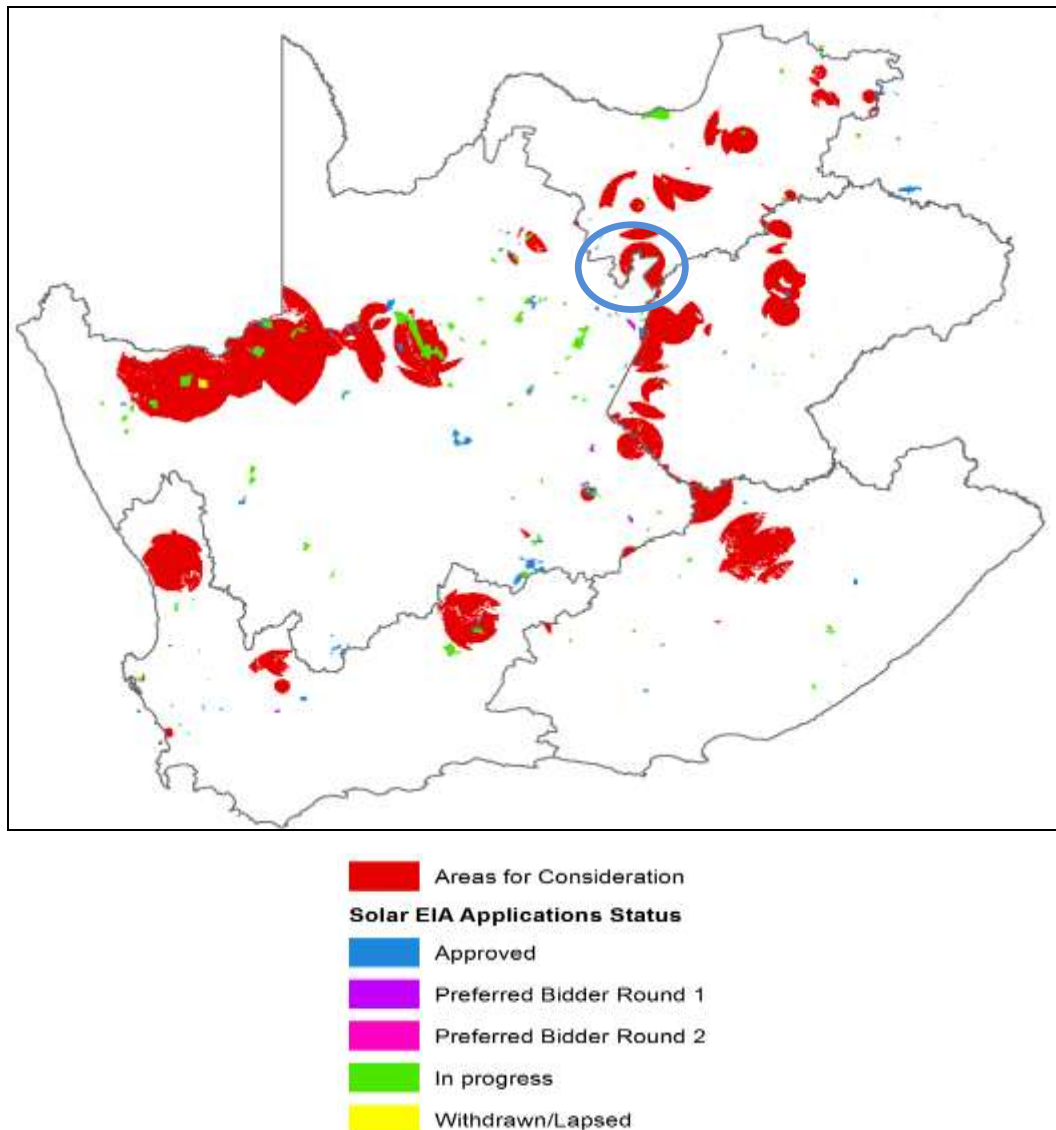
As part of the roll-out of renewable energy in South Africa, the Department of Energy (DoE) has entered into a bidding process for the procurement of 3725 MW of renewable energy from independent power producers by 2016.

To identify geographical areas best suited for the roll-out of wind and solar PV energy projects, referred to as Renewable Energy Development Zones, the DEA subsequently

commissioned the Council for Scientific and Industrial Research (CSIR) to undertake a Strategic Environmental Assessment (SEA) for the identification of suitable geographical areas (corridors/zones) for the efficient and effective rollout of solar PV energy in South Africa, referred to as Renewable Energy Development Zones (REDZs). It is envisaged that solar PV development will be incentivised and streamlined in the REDZs.

The wind and solar PV SEA is the first to be undertaken by DEA as part of facilitating efficient implementation of the Strategic Integrated Projects (SIPs) introduced in the 2012 National Infrastructure Development Plan. This wind and solar energy SEA forms part of SIP 8, which is the promotion of green energy in support of the South African economy.

For the purpose of spreading development over the study areas, the top PV solar development potential was determined per province during the SEA process, while the approved PV Solar projects were also mapped (Figure 1).

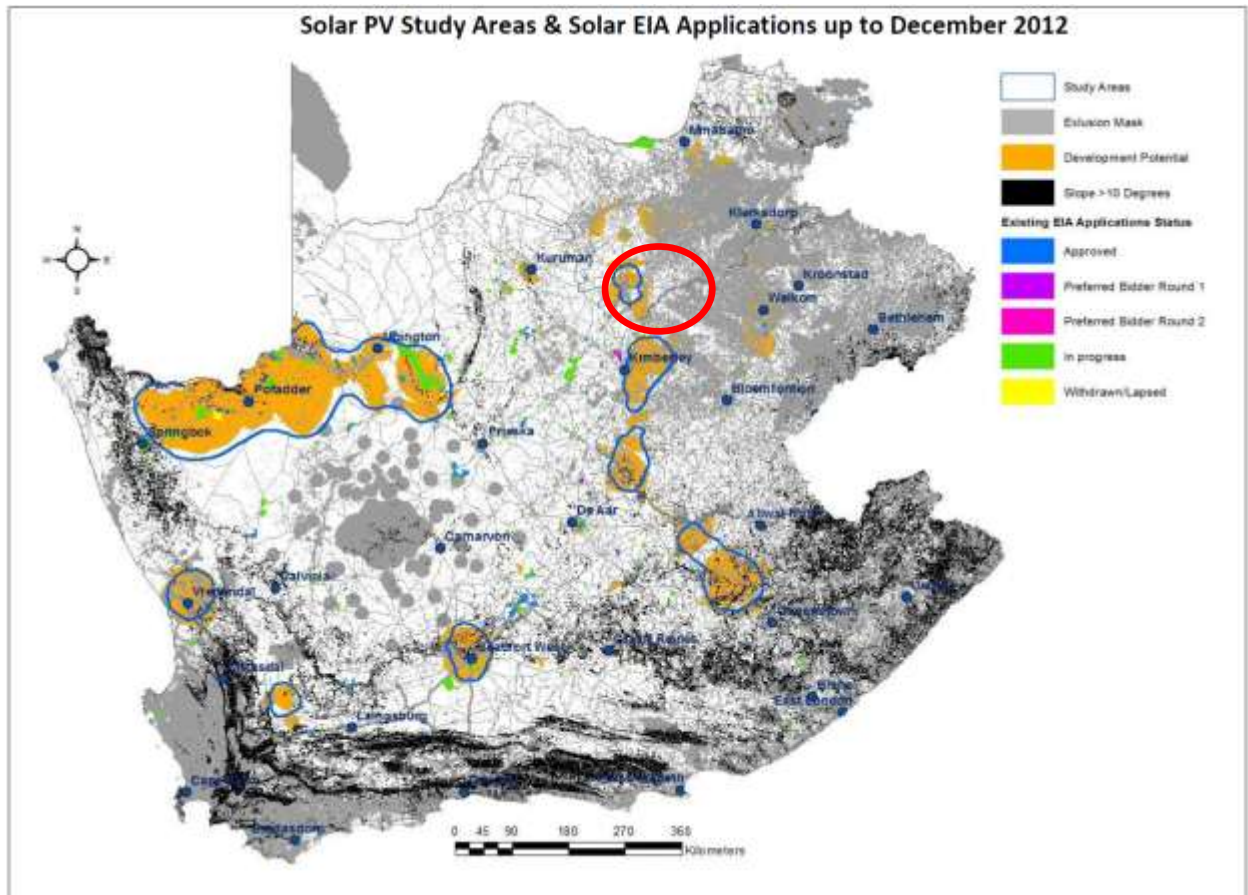


**Figure 6:** Top solar PV development potential areas identified during phase I of the SEA for the identification of suitable geographical areas for the efficient and effective rollout of solar PV energy in South Africa.



The Greater Taung Local Municipality (GTLM) is included in one of the top PV solar development potential areas identified during the SEA process, confirming that the Taung and Reivilo areas have great potential to generate electricity from solar energy in the North-West Province (Figure 6).

The study areas identified during Phase I of the SEA will be further investigated during Phase II of the SEA (Figure 7). Phase II will entail the refinement of the study areas through broad stakeholder consultation, as well as specialist assessments. An area of 1594 km<sup>2</sup>, including 111 portions of land, referred to as the Gamoduana study area, that includes part of the GTLM, has been identified as such a study area (Figure 7).



**Figure 7:** Phase II solar PV study areas identified during phase 1 of the SEA for the identification of suitable geographical areas for the efficient and effective rollout of solar PV energy in South Africa.

### 3.3 Desirability of the Brakfontein Solar PV Plant

#### 3.3.1 Local socio-economic value of the Brakfontein Solar PV Plant

The Greater Taung Local Municipality (GTLM), which covers an area of 5 639 km<sup>2</sup>, is predominantly rural, with approximately 106 widely-scattered villages. It has an unemployment rate of approximately 50%, a dependency ratio of more than 75 and experienced negative economic growth between 2001 and 2011. The vision of the GTLM is to be a prosperous community that is socially, culturally and economically sustainable, while the mission is initiating and promoting sustainable socio-economic growth. One of the objectives of the GTLM Department Infrastructure Development, as



stated in the 2012/2017 IDP, is to: “*explore opportunities of feeding clean energy into the national energy grid*”. This development can play an integrated part in fulfilling this objective, as well as the municipal vision and mission.

It will also benefit the local community of Taung and Reivilo directly by generating limited skilled and unskilled employment opportunities for the local community during the construction and operational phases, thereby contributing to poverty alleviation in the region. During the construction phase of the project, 3310 person-month employment opportunities will be created (or approximately 140 jobs per month for a period of two years) at an expected value of R48 million, 64% of which will accrue to previously disadvantaged individuals. Twenty-six permanent jobs will be created during the operational phase of the PV facility, with an expected current value of employment activities of R3.76 million during the first 10 years, 60% of which will accrue to previously disadvantaged individuals.

The proposed development will in this respect also address the objectives of the New Growth Plan that focus on facilitating growth in sectors able to create employment and encouraging investment.

It will also benefit the local community indirectly through benefits associated with the provision of accommodation, catering and local spending by contractors. The development will also contribute to the development and maintenance of service infrastructure in the area.

The Independent Renewable Energy Power Producers Procurement Programme (REIPPPP) requires that every project must have a proportion of participation/ownership by local communities. This requirement may be met through the establishment of an Educational Trust that will:

- provide scholarships to school leavers from the Taung and Reivilo area who wish to study engineering, science or maths at tertiary level;
- subsidise science and maths teachers' salaries at schools in the Taung and Reivilo area so as to enable those schools to attract good and well qualified teachers and;
- subsidise the purchase of laboratory equipment and mathematical teaching aids in schools in the Taung and Reivilo area.

### **3.3.2 Additional socio-economic value of the Brakfontein Solar PV Plant**

The proposed development is also consistent with the Renewable Energy Independent Power Producer Procurement Programme as initiated by the Department of Energy. The PV facility will benefit society in general by alleviating the pressure of electricity generation from coal in a small way and also contributing to the government's target for renewable energy. The expected capital value of the development will be R1.6 billion on completion and the expected annual income that will be generated by or as a result of the development is R260 million.

The proposed development site is currently used for extensive livestock farming. Although there will be negative environmental impacts associated with the proposed development, it is anticipated that the benefits of the construction and operation of the PV facility will outweigh the negative impacts thereof, provided that the proposed mitigation measures are implemented effectively.

### **3.4 Desirability of the site for the Brakfontein Solar PV Plant**

On a farm level, the site selection process located sites that matched as many as possible of the ideal criteria for the development of a PV electricity generation plant. The selection criteria filtered out alternative sites, which are in some way or other not suitable for the development of a PV facility that is environmentally and economically sustainable. This resulted in the identification of the farm Brakfontein 897 HN which suits the development of a solar PV plant ideally, with no sensitive environmental features occurring on site.

## **4 Description of the property and environment that may be affected**

According to subsection 24(4) of the National Environmental Management Act No. 107 of 1998, procedures for the investigation, assessment and communication of the potential impact of activities must, with respect to every application for an environmental authorisation, ensure as a minimum an investigation of the environment likely to be significantly affected by the proposed activity and alternatives thereto (Figure 8)

### **4.1 Baseline description of the environment that may be affected by the activity**

#### **4.1.1 Location of the proposed site for the Brakfontein Solar PV Plant**

The proposed Brakfontein Solar PV plant will be situated in the quarter degree square 2724CB on the farm Brakfontein 897 HN (SG code TOHN00000000089700000), approximately 35 km west of Taung and 27 km east of Reivilo in the North West Province (Figures 9 and 10). The approximate centre of the proposed development is at S27°35'13.65", E024°25'07.08" and corners of the proposed development are (i) S27°34'51.16° E024°24'12.64", (ii) S27°34'52.25" E024°25'24.95", (iii) S27°35'21.48" E024°25.58.60", (iv) S27°35'31.47" E024°25'59.03", (v) S27°35'32.23" E024°24'39.97".

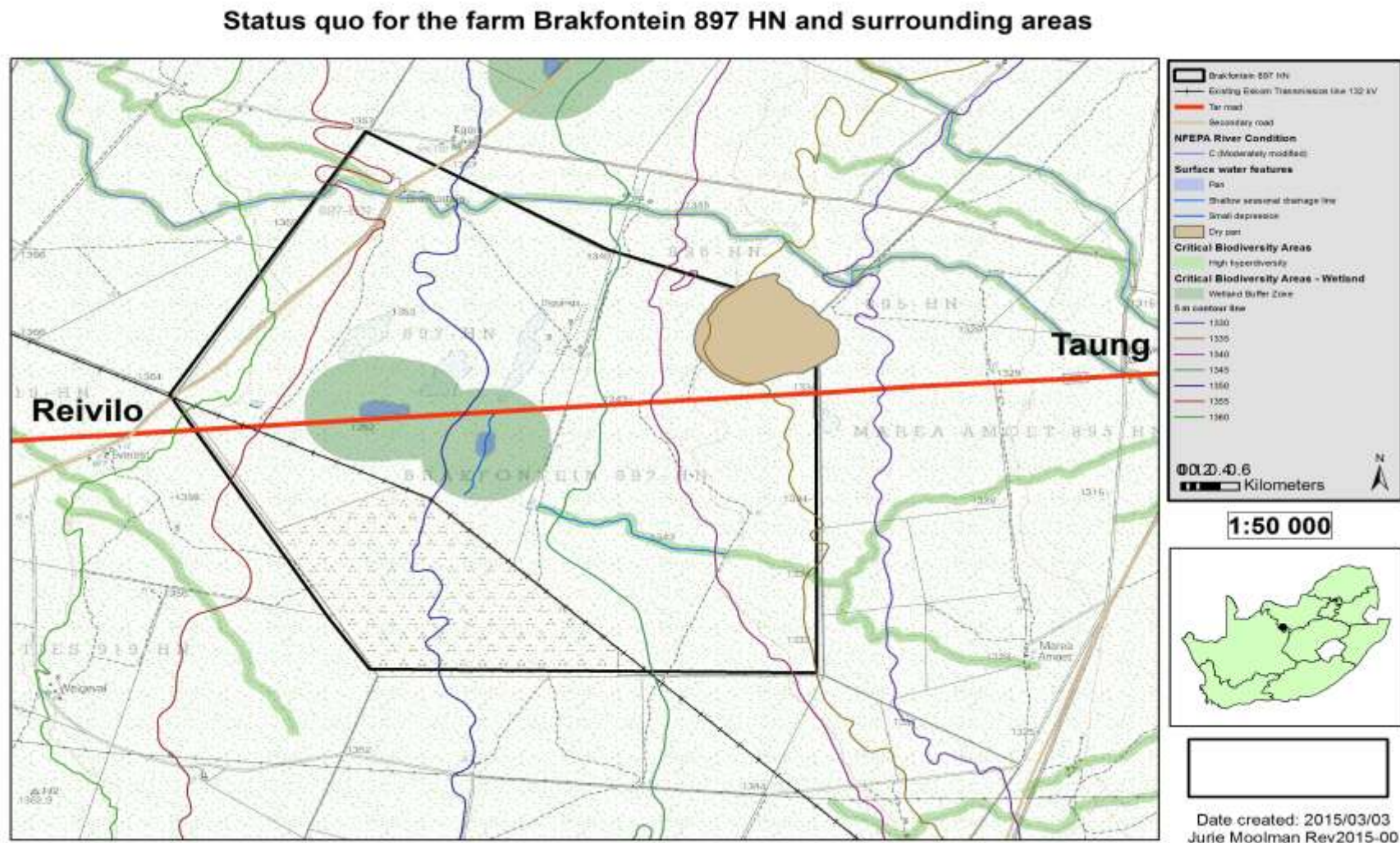
#### **4.1.2 Climate**

The farm Brakfontein 897 HN is situated in the summer and autumn rainfall region of South Africa with very dry winters. The mean annual precipitation of the region is approximately 400 mm. The region has a mean annual potential evaporation of 2 728 mm, which is almost seven times higher than the mean annual rainfall.

Frost is frequent to very frequent in the winter months, with temperatures reaching lows of -5°C in the winter months and highs of above 35°C in the summer months.

#### **4.1.3 Topography**

The proposed development site is situated approximately 1 360 m above sea level. From Taung, the topography gently ascends onto the Ghaap Plateau towards Reivilo. The topography at the Brakfontein site is very flat with little to no variation in topography (Figure 12). The average slope of the site, north-south is 0.9% and the average slope east-west is 1.1%



**Figure 8:** Status quo for the farm Brakfontein 897 HN and surrounding areas.

#### **4.1.4 Geology**

The geology consists of surface limestone of the Tertiary to Recent age, as well as dolomite and chert of the Campbell Group (Griqualand West Supergroup, Vaalian Erathem) (Figure 11). The geology supports shallow soil (0.1 – 0.25m) of the Mispah and Hutton soil forms, with very little erosion.

Numerous dolerite and diabase dykes are also present in the area. These dykes vary from a few meters to more than 50 m thick and are vertical to near vertical. Dyke localities can normally be identified by distinct linear surface limestone ridges elevated some 0.5 to 2 m higher than the surrounding areas. Two such dykes occur in the vicinity of the proposed development site.

#### **4.1.5 Soils**

The site consist of well drained, shallow (<30mm), stony soils with large angular rocks on the soil surface. It can best be defined as a soil-rock complex with Mispah soil form, interspersed with Glenrosa soil form (Figure 11).

The Mispah soil form consists of an Orthic A-horizon over hard rock (which is the limiting soil layer). It is shallow (<30mm), moderately physically active and slightly sensitive to both wind and water erosion. The current soil surface condition is generally good. Livestock ranching and wildlife conservation are the best land use for Mispah soils.

The Glenrosa soil form consists of an Orthic A-horizon over a lithocutanic B-horizon. It is shallow and at the most 50mm deep, moderately physically active and slightly sensitive to both wind and water erosion. The current soil surface condition is generally good. Livestock ranching and wildlife conservation are the most common types of land use on Glenrosa soils, although cropping is possible on deeper and less stony variants.

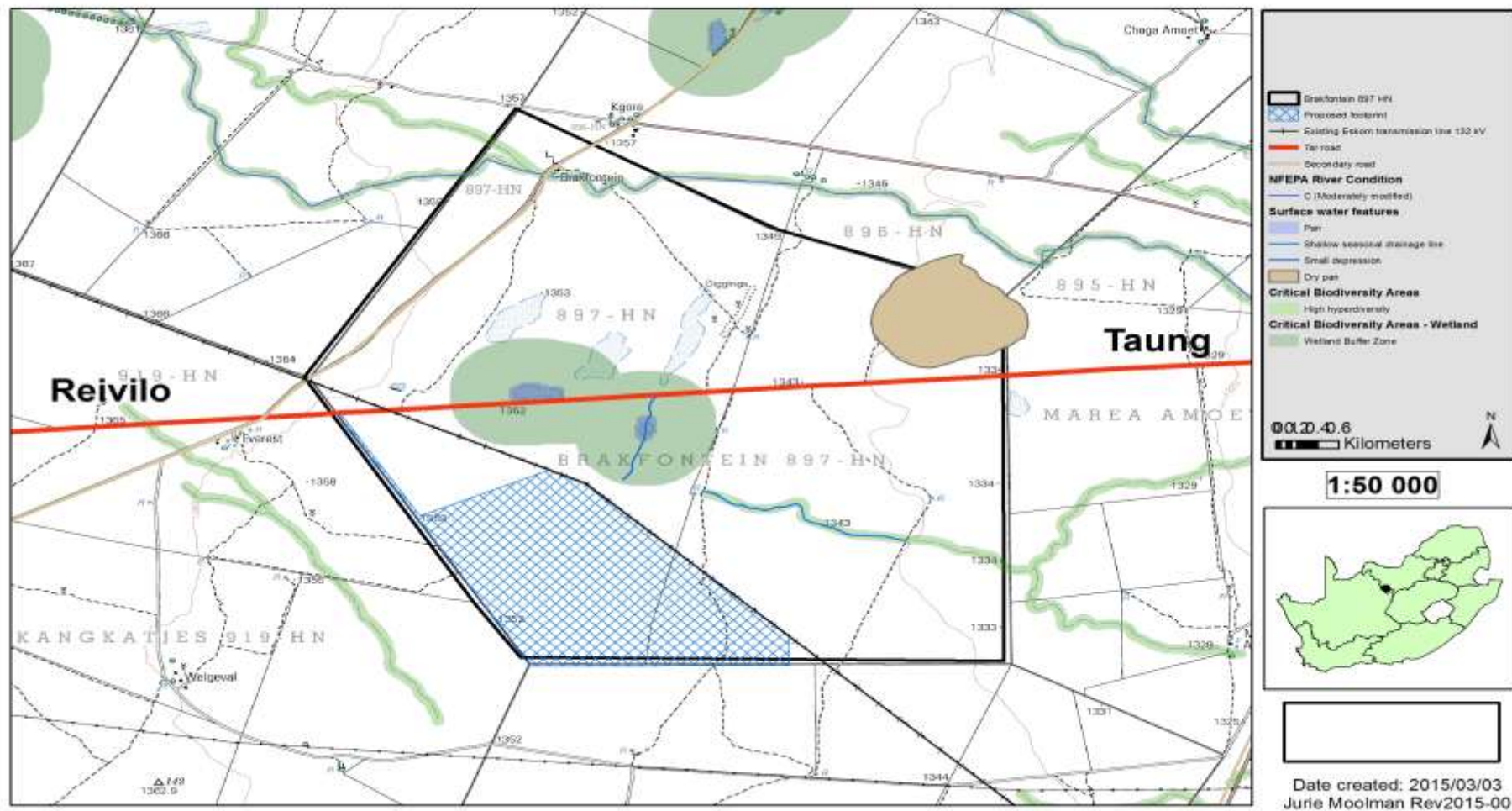
Lithic soils provide useful morphological indications of the nature of fractured rock aquifers. These are of interest to groundwater hydrologists because they require special consideration of preferential flow paths, when modelling groundwater movement and recharge in the assessment of aquifer vulnerability to pollution.





**Figure 9:** Proposed site location of the Brakfontein Solar PV plant relevant to the towns of Reivilo (west) and Taung (east).

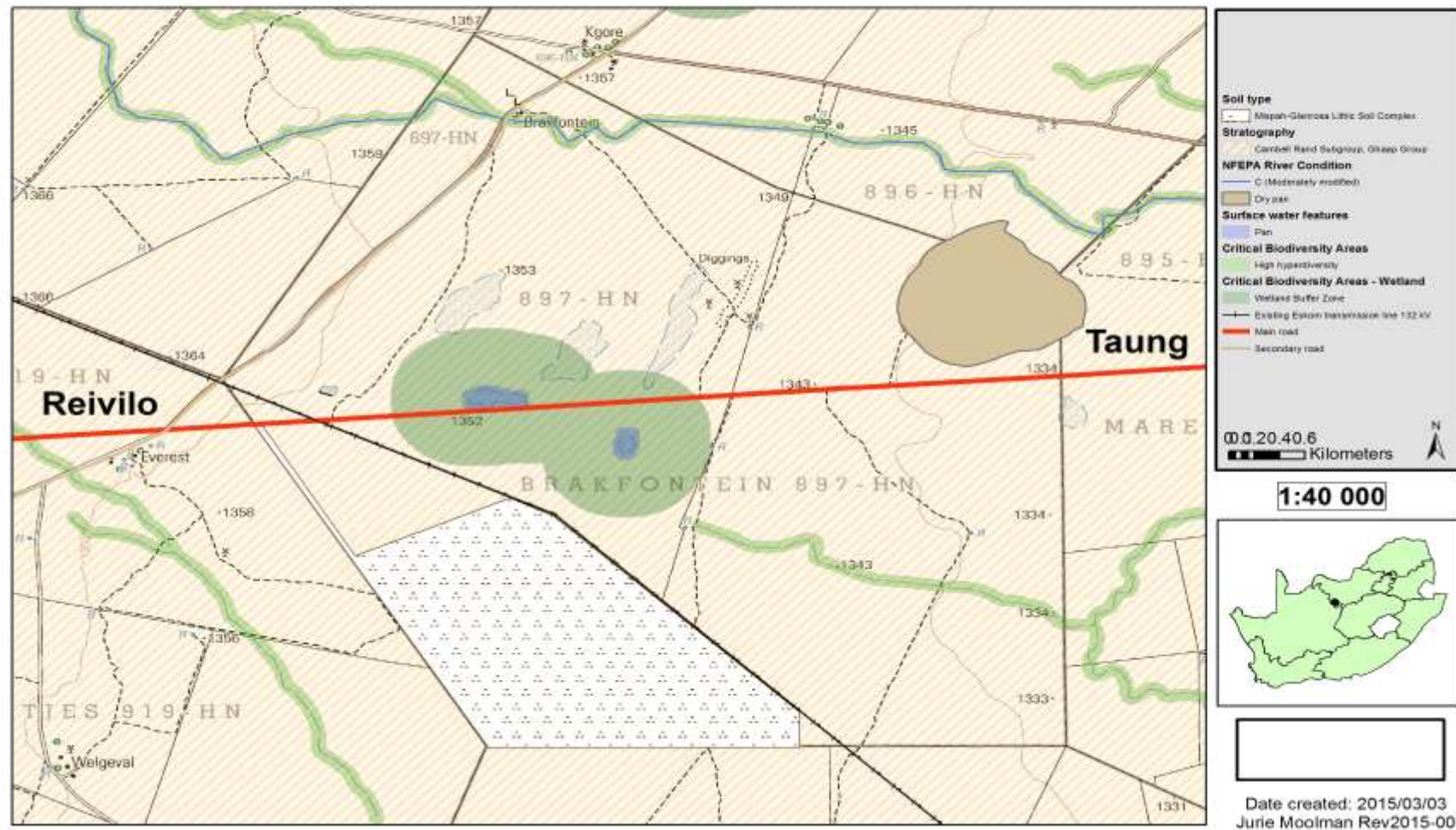
### Proposed site for the Brakfontein Solar PV Plant



**Figure 10:** 1:50 000 locality map, indicating the property on which the proposed PV power plant will be constructed



### Geology and soil type of the Brakfontein Solar PV plant



**Figure 11:** 1:40 000 map indicating the geology and soil underlying the proposed Brakfontein Solar PV plant.



#### 4.1.6 Vegetation

The proposed development site is situated in the Savannah biome, Eastern Kalahari Savannah Bioregion. The vegetation on and around the proposed development site forms part of the Ghaap Plateau Vaalbosveld vegetation unit (Figure 14). This vegetation unit is characterised by a well-developed shrub layer with *Tarchonanthus camphoratus* and *Acacia karoo*, as well as an open tree layer consisting of *Olea europaea* subsp. *africana*, *Acacia tortilis*, *Acacia mellifera*, *Zizphus mucronata* and *Rhus lancea*. Table 3 provides a summary of the important taxa within the Ghaap Plateau Vaalbosveld, while Figure 12 provides an idea of some vegetation at the proposed development site.

A ecological survey undertaken during the months of September 2014 through to February 2015 indicated that no critically endangered, endangered, vulnerable, declining, and protected, near threatened, critically rare or rare plant species are resident on the proposed development site.

The specialist study concluded that the condition of the natural vegetation is fair. In the case that the proposed development is constructed, there will be some habitat loss. There appears to be no loss of any particular sensitive species, if the site is developed according to the present preferred lay out.





**Figure 12:** Topography and vegetation of the proposed development site on the farm Brakfontein 897 HN.

**Table 3:** Dominant species within the Ghaap Plateau Vaalbosveld vegetation unit.

<b>Vegetation Type</b>	<b>Ghaap Plateau Vaalbosveld</b>
<b>Tall trees:</b>	<i>Acacia erioloba</i>
<b>Small trees:</b>	<i>Acacia mellifera</i> subsp. <i>detinens</i> , <i>Rhus lancea</i> , <i>Acacia karroo</i> , <i>Acacia tortilis</i> subsp. <i>heteracantha</i> , <i>Boscia albitrunca</i>
<b>Tall shrubs:</b>	<i>Olea europaea</i> subsp. <i>africana</i> , <i>Rhigozum trichotomum</i> , <i>Tarchonanthus camphoratus</i> , <i>Ziziphus mucronata</i> , <i>Diospyros austro-africana</i> , <i>Diospyros pallens</i> , <i>Ehretia rigida</i> subsp. <i>rigida</i> , <i>Euclea crispa</i> subsp. <i>ovata</i> , <i>Grewia flava</i> , <i>Gymnosporia buxifolia</i> , <i>Lesserthia frutescens</i> , <i>Rhus tridactyla</i>
<b>Low shrubs:</b>	<i>Acacia hebeclada</i> subsp. <i>hebeclada</i> , <i>Aptosimum procumbens</i> , <i>Chrysocoma ciliata</i> , <i>Helichrysum zeyheri</i> , <i>Hermannia comosa</i> , <i>Lantana rugosa</i> , <i>Leucas capensis</i> , <i>Melolobium microphyllum</i> , <i>Peliostomum leucorrhizum</i> , <i>Pentzia globosa</i> , <i>P. viridis</i> , <i>Zygophyllum pubescens</i>
<b>Succulent herbs:</b>	<i>Hertia pallens</i> , <i>Lycium cinereum</i>
<b>Semi parasitic Shrub:</b>	<i>Thesium hystrix</i>
<b>Woody climbers:</b>	<i>Asparagus africanus</i>
<b>Graminoids:</b>	<i>Antheophora pubescens</i> , <i>Cenchrus ciliaris</i> , <i>Digitaria eriantha</i> subsp. <i>eriantha</i> , <i>Enneapogon scoparius</i> , <i>Eragrotis lehmanniana</i> , <i>Schmidtia</i>

Vegetation Type	Ghaap Plateau Vaalbosveld
	<i>pappophoroides</i> , <i>Themba trianda</i> , <i>Aristida adscensionis</i> , <i>A. congesta</i> , <i>A. diffusa</i> , <i>Cymbopogon pospischilii</i> , <i>Enneapogon cenchroides</i> , <i>E. desvauxii</i> , <i>Eragrostis echinochloidea</i> , <i>E. obtusa</i> , <i>E. rigidior</i> , <i>E. superba</i> , <i>Fingerhuthia africana</i> , <i>Heteropogon contortus</i> , <i>Sporobolus fimbriatus</i> , <i>Stipagrotis uniplumis</i> , <i>Tragus racemosus</i>
<b>Herbs:</b>	<i>Barleria macrostegia</i> , <i>Geigeria filifolia</i> , <i>G. ornativa</i> , <i>Gisekia africana</i> , <i>Helichrysum cerastioides</i> , <i>Heliotropium ciliatum</i> , <i>Hermbstaedtia odorata</i> , <i>Hibiscus marlothianus</i> , <i>H. pusillus</i> , <i>Jamesbrittenia aurantiaca</i> , <i>Limeum fenestratum</i> , <i>Lippia scaberrima</i> , <i>Selago densiflora</i> , <i>Vahlia capensis</i> subsp. <i>vulgaris</i>
<b>Succulent Herb:</b>	<i>Aloe grandidentata</i>

#### 4.1.7 Fauna

The recent ecological survey of the proposed development site also determined that no mammal, beetle, scorpion, reptile, amphibian or butterfly species of particular conservation priority is present on the site. A list of 36 bird species of particular high conservation priority in the North West Province, which have the potential to occur on the proposed development site, was compiled. Though, during the ecological survey none of the birds listed were recoded and is likely to use the proposed development site as breeding area or as habitat.

#### 4.1.8 Hydrology

The proposed development site on the farm Brakfontein 897 HN is situated in the Lower Vaal Water Management Area, in quaternary catchment C33A in the Ghaap Plateau Hydrogeological Region.

##### 4.1.8.1 Surface water

The most significant surface water resource in the region of the proposed Brakfontein development site is the Dry Harts River, approximately 30 km east of the site. Only two delineated wetlands are noted within the surroundings of the proposed development site, both to the north of the proposed development site of the solar PV plant (Figure 10).

No significant surface water resources are located on the proposed development site. On-site surface water features consist of small pan-like structures (Figure 13) which form in rainy seasons and a few drainage lines. Due to the slow infiltration rate of the dolomitic surfaces in the area, these pan-like structures are likely to contain surface water for some months after excessive rain events before infiltration or evaporation.



**Figure 13:** Small pan-like feature scattered across the proposed development site.

#### 4.1.8.2 Ground water recharge and quality

The Ghaap Plateau is fed by underground water from aquifers (Figures 15 and 16) in the underlying dolomites. Good supplies of ground water are located in fractures and leached zones associated with dykes and faults, as well as on the contact with chert beds. High yielding boreholes are located some distance away from the thick dykes (40-80 m from dyke contact) and closer to the thin dykes (within 10 m from contact).

The recharge rate of aquifers located nearby the town of Reivilo is summarised in Table 4.

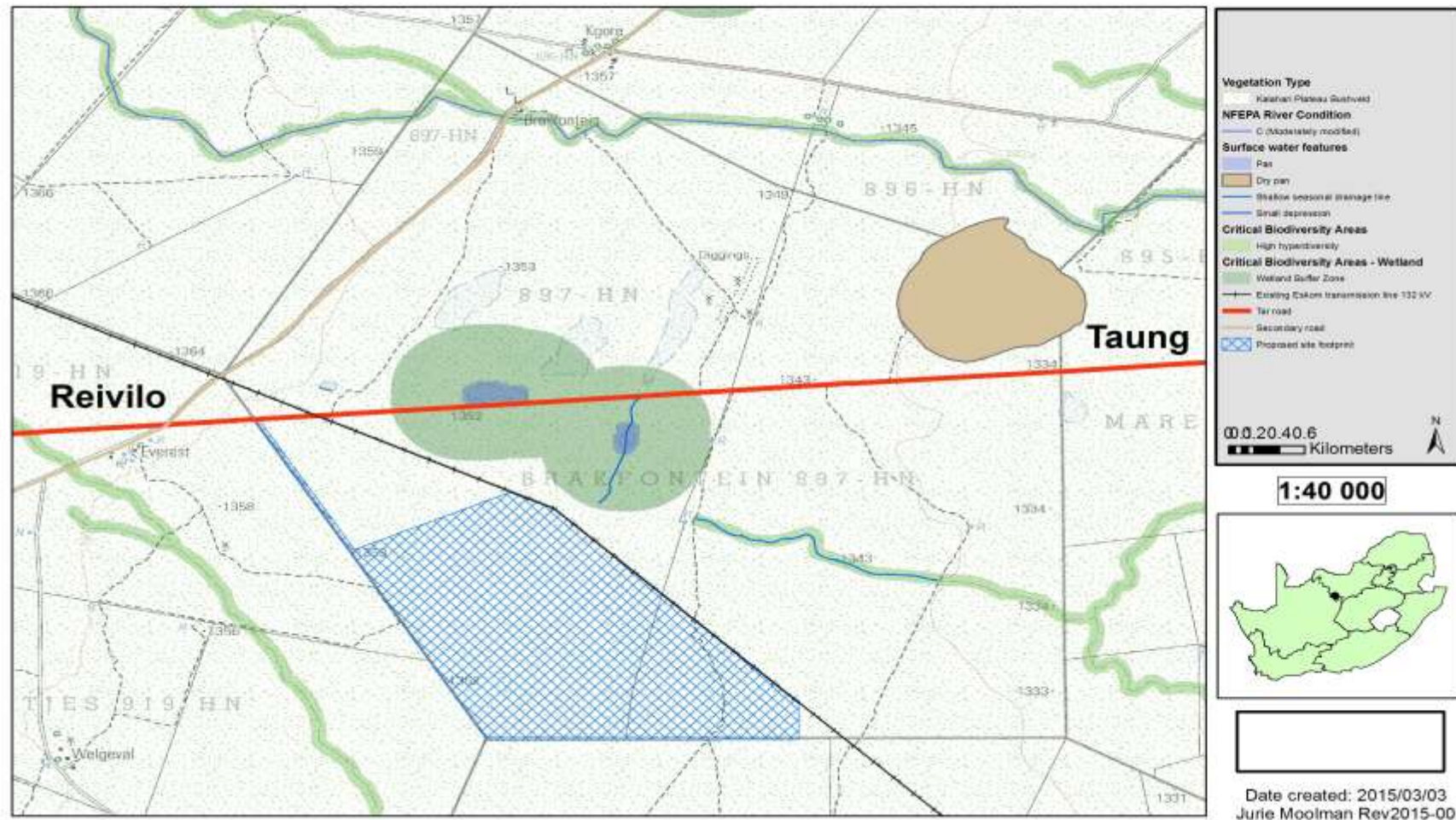
**Table 4:** Recharge rate of aquifers near the town of Reivilo.

Quaternary Catchment	Locality	Area (km <sup>2</sup> )	Mean annual precipitation (mm)	Estimated recharge (mm/a)	Recharge as % of mean annual precipitation
C33B	Reivilo	2831	422	25.51	6.05

Groundwater quality in the Ghaap Plateau dolomites varies significantly with electrical conductivity (EC) ranging from 6 to > 500 mS/m. In almost all the cases ground water with high EC's could be linked to nitrate pollution from kraals, French drains (which are commonly used on the farms) or fertilizers used on irrigated lands.

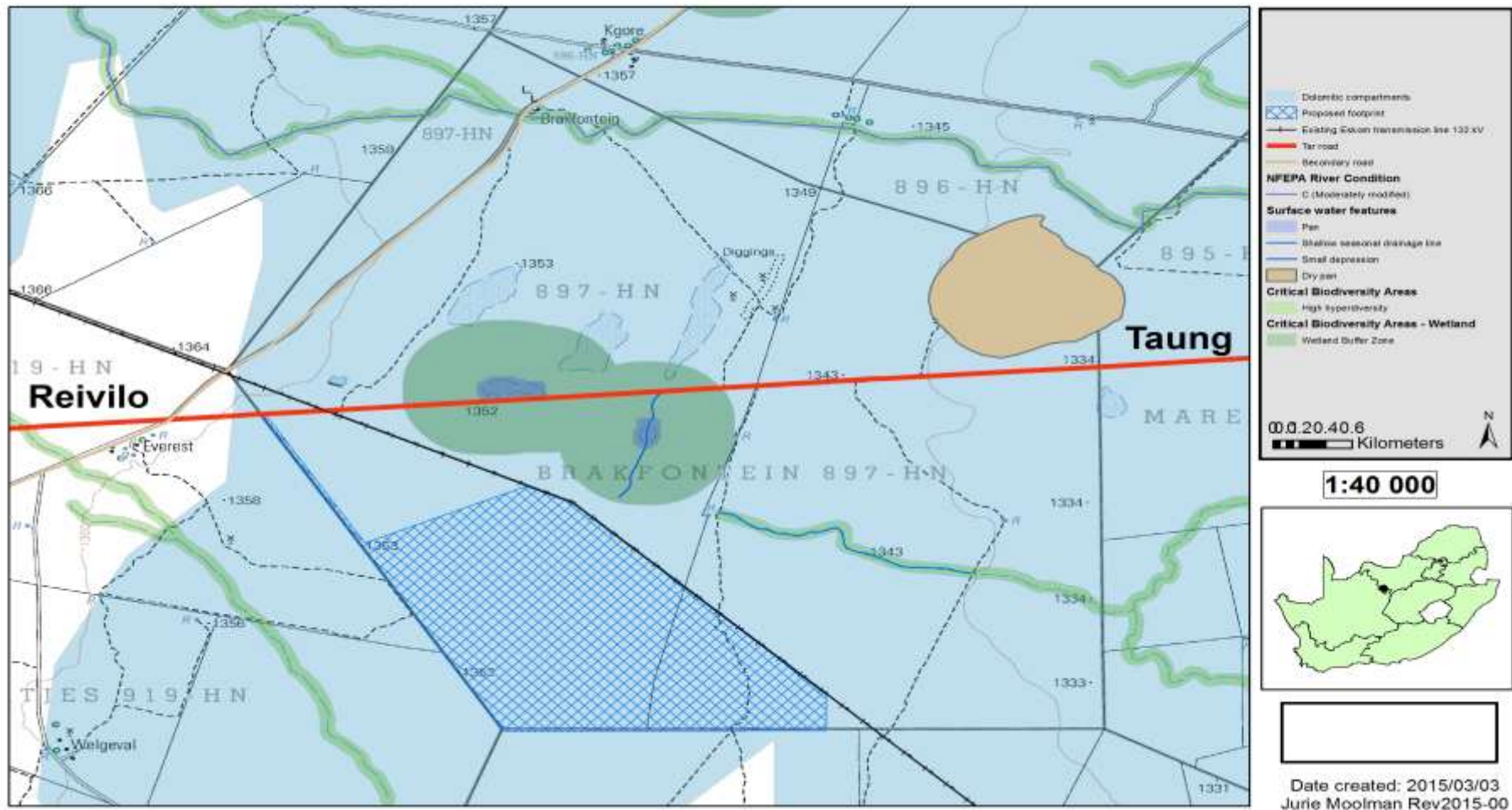


### Vegetation type at and around the Brakfontein Solar PV plant site



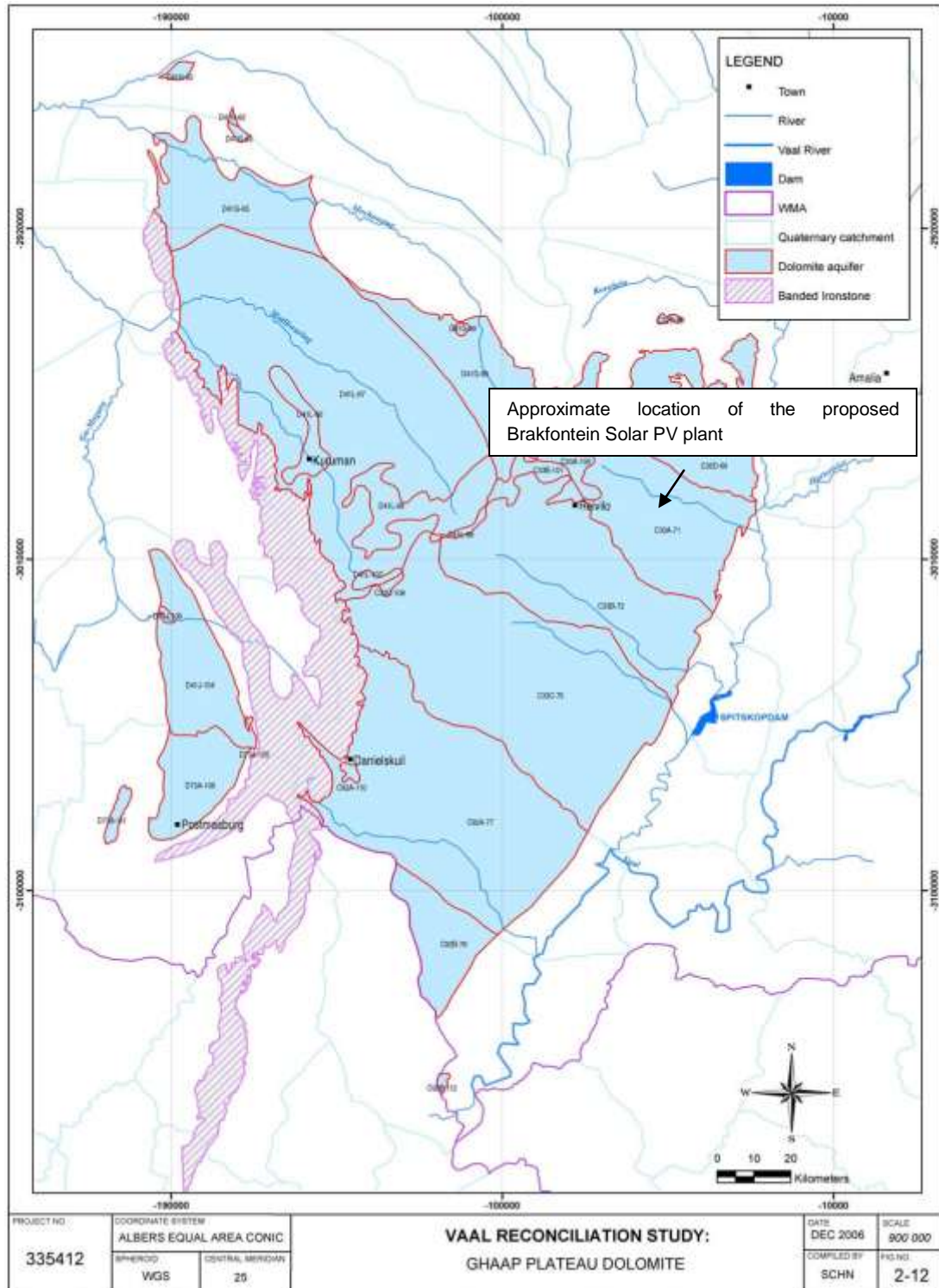
**Figure 14:** Vegetation type found on the proposed Brakfontein Solar PV plant site.

### Dolomitic compartments at and around the Brakfontein Solar PV plant site



**Figure 15:** Dolomitic compartments of the proposed development site.





**Figure 16:** Underlying dolomites on the Ghaap Plateau which supply most of the water for agricultural and domestic purposes in the region.

#### 4.1.9 Land use

At present, the farm Brakfontein 897 HN is used exclusively for agricultural purposes. Cattle farming is the main agricultural activity on the farm, with the farm having a carrying capacity of approximately 25 ha per head of cattle. This means that the

proposed development site could sustain approximately 11 life stock units or 7 medium framed beef cows respectively.

If the site is not utilized for agricultural production during the lifetime of the project the loss of agricultural potential and food production is still considered to be negligible due to the relatively small size of the site (~275ha) and its relatively low grazing and carrying capacities

#### **4.1.10 Archaeological, Heritage and Palaeontological characteristics**

##### **4.1.10.1 Archaeological characteristics**

A number of archaeological sites have been identified along the Harts River Valley. These sites range from rock art to Early Stone Age sites. The closest distance between the study area and Harts River is roughly 23 km.

The proposed development site is located some distance away from the Harts River and based on previous heritage and archaeological reports undertaken in this area, archaeological sites appear to occur less frequently in the flat and dry areas found in proximity to the study area than what is the case closer to the Harts River or further to the west.

##### **4.1.10.2 Heritage characteristics**

Although the historic overview of the study area and surroundings has revealed a long and significant history for the surroundings of the study area, almost none of the historical events highlighted in this Heritage Impact Assessment can be positively linked to the study area itself. This said, in a number of cases, mention is made to properties and localities located in the general vicinity of the present study area.

##### **4.1.10.3 Palaeontological characteristics**

The Reivilo formation consists of a range of shallow marine and lacustrine stromatolites (some very large), oolites, pisolites in carbonates, filamentous and coccoid organic walled microfossils (eg cyanobacteria) in siliciclastics/carbonates as well as cherts of banded iron formations (BIF): Schmidtsdrift, Campbell Rand and Asbestos Hills Subgroups.

The proposed development site can be associated with Cenozoic aged cave breccias. These breccias are related to the dolomites of the Ghaap Group and can contain extremely important fossil remains, including the remains of Hominids.



## **5 Public Participation**

### **5.1 Public participation process reported in Scoping Report**

The following activities have already been reported on in the scoping report that was approved by the DEA on 19 March 2015.

- Steps taken to notify potentially I&APs of the application
  - Pre-application consultation with competent authority;
  - Submission of Application form for Environmental Authorisation;
  - Invitations to I&APS – registered letters, sites notices, background information documents and advertisements in the newspaper;
  - Public meeting; and
  - Scoping Report.
- Proof of site notices, advertisements and notices notifying potentially I&APS
- A summary of issues raised by I&APS, the date of receipt of and the response of the EAP to those issues
- Copies of the minutes of any meetings held by the EAP with I&APs and other role players which record the views of the participants.

### **5.2 Public participation process after submission of the Scoping Report**

The Final Scoping Report was circulated to all registered I&APs (Table 5) for review and commenting.

The following public participation activities have been undertaken since the submission and approval (19 March 2015) of the Final Scoping report:

- Copies of the Background Information Document as well as a copy of the approved Final Scoping Report have been forwarded to the following Departments and organisations. The Departments and organisations have also been invited to participate in the process;
  - Department of Transport;
  - Department of Telecommunications;
  - South African Civil Aviation Authority;
  - SENTECH;
  - South African National Road Agency;
  - Endangered Wildlife Trust and;
  - Birdlife.

The Final EIA Report and EMPr have been made available for comment by I&APs on the 21<sup>st</sup> of April 2015 for a 30-day commenting period through the following mechanisms:

- A Hard copy will be made available to the public at the Greater Taung Local Municipality;
- Hard copy will be made available through the assistance of the Reivilo Farmers Union;
- Electronic copies will also be made available upon request;
- Hard or electronic copies be posted forwarded to the following governmental institutions and organisations:
  - Department of Environmental Affairs
  - Department of Agriculture, Forestry and Fisheries;
  - Department of Transport;
  - Department of Water Affairs (Regional Office: Kimberley)
  - South African Heritage Resources Agency (via SAHRIS)
  - Department of Telecommunications;
  - North West Department Of Rural Environmental And Agricultural Development
  - South African Civil Aviation Authority;
  - SENTECH;
  - South African National Road Agency;
  - Endangered Wildlife Trust and;
  - Birdlife.

Letters have been sent to all the registered I&APs, informing them of the availability of the draft EIA report for review (Appendix 2). At the end of the commenting period, the draft EIA report and EMP have been reviewed and revised, before submission to the relevant CAs for consideration.

All comments by I&APs and CAs and associated responses will be recorded in the I&AP issue and response register and dealt with accordingly.

### **5.3 A list of all persons or organisations that were identified and registered as interested and affected parties in relation to the application in terms of regulations 55**

See Table 5

### **5.4 A summary of issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues**

See Table 6

**Table 5:** Identified Interested and Affected Parties

Institution	Name & Surname	Postal address	Email	Telephone	Fax
<b>Dr Ruth Segomotsi Mompoti District Municipality</b>					
DRSM District Municipal Manager	Zevo Lesego	PO Box 21, Vryburg, 8600			
<b>Greater Taung Local Municipality</b>					
Greater Taung Municipality: MM	Katlego Gabanakgosi	Private Bag X1048, Taung, 8580			053 994 2248
Greater Taung Municipality: Acting Municipal Manager	Godfrey Huma	Private Bag X1048, Taung, 8580			
Greater Taung Spatial Planning	Siphosethu Jijana		<a href="mailto:jjianas@taunglm.co.za">jjianas@taunglm.co.za</a>		
Greater Taung Municipality: Planning and Corporate Services	Godfrey Huma		<a href="mailto:humag@taunglm.co.za">humag@taunglm.co.za</a>		
Ward Councillor	Andries Scholtz	PO Box 67, Reivilo, 8595			0823384726
<b>Traditional Council</b>					
Batlhaping Ba-Ga Phuduhcwane Traditional Council	Kgosikgolo TF Mankuroane	Private Bag X534, Taung Village, 8584			
<b>National Departments and Agencies</b>					
Department of Environmental Affairs	Muhammad Essop		<a href="mailto:messop@environment.gov.za">messop@environment.gov.za</a>	012 395 1734	
Department of Agriculture, Forestry and Fisheries (DAFF), Directorate: Land Use and Soil Management	Anneliza Collett		<a href="mailto:AnnelizaC@nda.agric.za">AnnelizaC@nda.agric.za</a>	012 319 7508	012 329 5938
DAFF, Delegate of the Minister	Ms Mashudu Marubini	Private Bag X120, Pretoria, 0001	<a href="mailto:MashuduMa@daff.gov.za">MashuduMa@daff.gov.za</a>	012 319 7619	
DAFF AgriLand Liaison	Ms Thoko Buthelezi	Private Bag X120, Pretoria, 0001	<a href="mailto:ThokoB@daff.gov.za">ThokoB@daff.gov.za</a>	012 319 7634	
DAFF	D Nhlaka		<a href="mailto:nhlakad@daff.gov.za">nhlakad@daff.gov.za</a>		
Department Water Affairs (DWA), Kimberley Regional Office	Lerato Mokhoantle	Private Bag X1601, Kimberley, 8301			
DWA Kimberley Regional Office	Gawie van Dyk	Private Bag X1601, Kimberley, 8301	<a href="mailto:vandykg@dwa.gov.za">vandykg@dwa.gov.za</a>	053 836 7600	
DWA Kimberley Regional Office	A Abrahams	Private Bag X1601, Kimberley,	<a href="mailto:abrahamsa@dwa.gov.za">abrahamsa@dwa.gov.za</a>	053 836 7600	

Institution	Name & Surname	Postal address	Email	Telephone	Fax
		8301			
Department of Rural Development and Land Redistribution (DRDLR): Town and Regional Planner	Tshepiso Monnakgotla		<a href="mailto:Tmannakgotla@ruraldevelopment.gov.za">Tmannakgotla@ruraldevelopment.gov.za</a>	012 312 8681	
DRDLR: Environmental Planner	Mpho Mashua		<a href="mailto:AMMashau@ruraldevelopment.gov.za">AMMashau@ruraldevelopment.gov.za</a>	012 312 8681	
DRDLR: Chief Town and Regional Planner	Magezi Enock Mhlanga		<a href="mailto:memhlanga@ruraldevelopment.gov.za">memhlanga@ruraldevelopment.gov.za</a>	012 312 8668	
South African Heritage Resources Agency	Phillip Hine		<a href="mailto:phine@sahra.org.za">phine@sahra.org.za</a>		
Department of Transport: Deputy Director Knowledge Management	Xisalandzaku Ramafoka	159 Struben Street, Pretoria, 0002		012 309 3818	
Department of Telecommunications: Media Liaison Officer	Siya Qoza	Private bag X860, Pretoria, 0001	<a href="mailto:sqoza@dtps.gov.za">sqoza@dtps.gov.za</a>	012 427 8511	
SANRAL	Victoria Bota	38 Ida Street, Menlo Park, 0081	<a href="mailto:BotaV@nra.co.za">BotaV@nra.co.za</a>	012 426 6200 073 871 7551	
SACAA	Liezel Stroh		<a href="mailto:strohl@caa.co.za">strohl@caa.co.za</a>	011 545 1232 083 461 6660	
<b>Provincial Department</b>					
North-West Department of Rural, Environmental and Agricultural Development (NWREAD)	B Moselakgomo		<a href="mailto:bmoselakgomom@nwp.gov.za">bmoselakgomom@nwp.gov.za</a>		
NW READ	J Mautsu				
NW READ	Steven Mukhola		<a href="mailto:smukhola@nwp.gov.za">smukhola@nwp.gov.za</a>		086 659 4060
North-West Department of Co-operative Government and Traditional Affairs, Chief Town and Regional Planner	M van Heerden		<a href="mailto:MVanHeerden@nwp.gov.za">MVanHeerden@nwp.gov.za</a>		
<b>Eskom</b>					

Institution	Name & Surname	Postal address	Email	Telephone	Fax
Eskom Senior Environmental Advisor, GC Land Development, Megawatt Park D1 Y38	John Geeringh	P O Box 1091, Johannesburg, 2000	<a href="mailto:john.geeringh@eskom.co.za">john.geeringh@eskom.co.za</a>	083 632 7663	
<b>SENTECH</b>					
Operational Centre	Rudy Welke	Private Bag X06, Honeydew, 2040		011 471 4728	
<b>Square Kilometre Array South Africa</b>					
SKA South Africa	Dr Adrian Tiplady	17 Baker Street, Rosebank, Johannesburg, 2196	<a href="mailto:atiplady@ska.ac.za">atiplady@ska.ac.za</a>	011 442 2434	
<b>Endangered Wildlife Trust</b>					
EWT	Claire Patterson-Abrolat	Private Bag X11, Modderfontein, 1609	<a href="mailto:clairep@ewt.org.za">clairep@ewt.org.za</a>	011 608 4682	
<b>Birdlife</b>					
Birdlife	Simon Gear	PO Box 515, Randburg, 2125	<a href="mailto:advocacy@birdlife.org.za">advocacy@birdlife.org.za</a>	0117891122	
<b>Farmers Association</b>					
Reivilo Farmers Association, Chairperson	Helmien Haddad van den Berg	PO Box 47, Reivilo, 8595	<a href="mailto:helmien@vodamail.co.za">helmien@vodamail.co.za</a>		
Reivilo Farmers Union, Chairperson	Fanie Smit	PO Box 319, Vryburg, 8600		082 944 0385	
<b>Adjacent landowners</b>					
	Charl Wolhuter	PO Box 307, Magogong, 8575	<a href="mailto:cwol@lantic.net">cwol@lantic.net</a>	082 809 4375	
	Sarel and Lucy du Plessis	PO Box 63, Reivilo, 8595		082 773 2402	
	Louis Spruyt	PO Box 230, Reivilo, 8595		082 975 6947	
	Ben-Karel Van Aswegen	PO Box 101008, Moreleta Plaza, 0167	<a href="mailto:ben@gadmin.co.za">ben@gadmin.co.za</a>	082 308 0654	
	Chris Lombaard	PO Box 6582, Flamwood, 2572	<a href="mailto:chrisl@motla.co.za">chrisl@motla.co.za</a>	079 694 5811	
<b>Other Registered I&amp;APs</b>					
	Kagiso Botha	PO Box 56, Reivilo, 8595		084 689 3236	

Institution	Name & Surname	Postal address	Email	Telephone	Fax
	David Lebang Motheo	PO Box 56, Reivilo, 8595		084 765 2231	
Vidigenix Pty Ltd	Armandt Joubert	514 Chironia Ave. Helderkruijn, 1724	<a href="mailto:administration@vidigenix.co.za">administration@vidigenix.co.za</a>	011 764 3731	

**Table 6:** A summary of issues raised by interested and affected parties and the response of the EAP to those issues

Interested and Affected Party	Date of receipt	Issue	Response
Mr Ben-Karel van Aswegen (Portion 2 Farm Kangkatjes 919 HN)	4 August 2014	<ul style="list-style-type: none"> <li>Who are all the parties that will benefit from this project?</li> </ul>	<p>The following parties will benefit from the project:</p> <ul style="list-style-type: none"> <li>The developer, who will benefit financially over the life of the project (20 years);</li> <li>The farm owner, who will benefit financially over the life of the project (20 years);</li> <li>Local service providers, who may be contracted during the construction of the solar power plant to provide accommodation and catering services;</li> <li>Local business through benefits associated with the local spending by contractors;</li> <li>The local communities of Taung and Reivilo, through the generation of limited skilled and unskilled employment opportunities during the construction and operational phases, thereby contributing to poverty alleviation in the region. ;</li> <li>The Greater Taung Local Municipality through the payment of rates and taxes;</li> <li>The Greater Taung Local Municipality Department Infrastructure Development, by meeting one of the 2012/2017 IDP objectives to explore opportunities of feeding clean energy into the national energy grid;</li> <li>The local community through the requirement of the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) that every project</li> </ul>

Interested and Affected Party	Date of receipt	Issue	Response
			<p>must have a proportion of participation/ownership by local communities. This requirement may be met through the establishment of an Educational Trust that will provide scholarships to school leavers from the Taung and Reivilo area who wish to study engineering, science or maths at tertiary level; subsidise science and maths teachers' salaries at schools in the Taung and Reivilo area so as to enable those schools to attract good and well qualified teachers and; subsidise the purchase of laboratory equipment and mathematical teaching aids in schools in the Taung and Reivilo area.</p> <ul style="list-style-type: none"> <li>• The broader South African community by alleviating the pressure of electricity generation from coal in a small way and also contributing to the government's target for renewable energy.</li> </ul>
		<ul style="list-style-type: none"> <li>• What Mega Watt will be generated and contributed to Eskom grid?</li> </ul>	<p>The solar PV plant will generate 75MW and will feed directly into the Eskom grid.</p>



Interested and Affected Party	Date of receipt	Issue	Response
		<ul style="list-style-type: none"> <li>Have all neighbours and relevant Farmers Associations been notified?</li> </ul>	Yes, all neighbours and relevant Farmers Associations have been notified by means of either e-mail, registered letters or fax or a combination of the fore mentioned.
		<ul style="list-style-type: none"> <li>Who will control and manage the construction of the site and thereafter the running of the project?</li> </ul>	The applicant, Brakfontein Solar PV Plant Pty (Ltd) will manage the construction site and the running of the project.
		<ul style="list-style-type: none"> <li>Time period of construction and time period of the project?</li> </ul>	The period of construction can be between 15 to 18 months and the project is foreseen to operate for a period of at least 20 years.
		<ul style="list-style-type: none"> <li>What will happen to the rest of the property?</li> </ul>	The rest of the property will continue to operate as a cattle farm.
		<ul style="list-style-type: none"> <li>Extent of Surveys to be conducted and over what period?</li> </ul>	<p>The specialist studies will be undertaken during the months of September and October 2014 and will include the following:</p> <ul style="list-style-type: none"> <li>Vegetation specialist study;</li> <li>Heritage Phase 1 specialist study;</li> <li>Paleontological specialist study;</li> <li>Visual assessment study;</li> <li>Geohydrological specialist study;</li> <li>Agricultural specialist study and;</li> <li>Faunal specialists study.</li> </ul>
Mr Ben-Karel van Aswegen (Portion 2 Farm Kangkatjes 919 HN)	4 August 2014	<ul style="list-style-type: none"> <li>Poaching (snaring, killing and hunting) and theft of wild life, cattle and other livestock and general theft on surrounding properties will increase due to the influx of people not</li> </ul>	Given the high material value of the solar field material, especially the cables and PV modules, and the risk of theft, it is imperative that the perimeter fences and security systems are installed and commissioned with the initial site establishment activities, so that there is a secure enclosed site prior to the high value materials

Interested and Affected Party	Date of receipt	Issue	Response
		from the area.	<p>arriving on site. The process will be to first fence off a delivery, storage and processing area within the site as a start and then to erect the perimeter fence and security, restricting the movement of site personnel to the actual construction site.</p> <p>No accommodation will be provided on site. The bulk of the site personnel will be transported to the site from where they will reside by bus, therefore restricting construction related movement by individuals.</p> <p>If the need arises, policing around the site may be stepped up, even including the contracting of a private security service, should it be required.</p>
		<ul style="list-style-type: none"> <li>Very high risk of veld fires will increase due to camp fires etc. especially in dry and winter seasons.</li> </ul>	No fires will be allowed on the development site for cooking purposes. The PV site will have fire breaks in place as required by law. Fire fighting equipment will also be available in case of veld fires. The applicant will also join the local fire fighting association.
		<ul style="list-style-type: none"> <li>Very high risk of water use (over consumption) and pollution (sewerage, chemical, oil and diesel spills) to natural shallow underground water supply.</li> </ul>	On average 9MI will be used during the construction phase, 60kl/day peak. 1.25MI per annum during the operation phase (that is, 3400l/day), mainly for periodical cleaning of the panels.
		<ul style="list-style-type: none"> <li>Monitoring natural water levels underground and rain flow and storm water.</li> </ul>	<p>If ground water is abstracted for the construction and operation of the site, borehole levels will be monitored quarterly to detect any overconsumption.</p> <p>The site currently drains naturally and the intent of a surface managed storm water system is to facilitate the natural drainage</p>

Interested and Affected Party	Date of receipt	Issue	Response
			and avoid flow concentrations and ponding. The drainage system proposed will be a surface management system based on not collecting storm-water, but rather spreading or distributing it over the site to soak away or drain slowly similarly to the normal pre-development flows. This will be achieved by minor earthworks and infrastructure, but mostly by sensitive planning. This avoids soil erosion and downstream flooding problems normally associated with the concentrated flows. The detail drainage and storm water surface management design will be done during the detail planning stage.
		<ul style="list-style-type: none"> <li>Noise and dust pollution.</li> </ul>	Noise will only be generated during the construction phase of the project. However, this will have a minimal impact on the surrounding areas, seeing that the site is isolated from any residential areas and will be at least 300m from the R372.
		<ul style="list-style-type: none"> <li>No electricity sources. How will cooking and lighting facilities be supplied on site?</li> </ul>	Electricity will be supplied by a generator.
		<ul style="list-style-type: none"> <li>High increase in littering and refuse removal.</li> </ul>	<p>Refuse bins with lids will be provided on site to minimise littering. Any littering that may occur will be contained by the proposed perimeter fence (either a 2.4 m weld-mesh or wire and netting fence that is electrified or a double barrier consisting of two 2.4 m high electric fences with only electric strands placed about 2 or more metres apart) around the site.</p> <p>Refuse generated on site will be removed weekly and dumped at an authorised landfill site.</p>

Interested and Affected Party	Date of receipt	Issue	Response
Mr Ben-Karel van Aswegen (Portion 2 Farm Kangkatjes 919 HN)	4 August 2014	<ul style="list-style-type: none"> <li>How many people to be employed during construction and what time period? How many people to be employed after construction and for what time period? Where will these people be sourced from? Skills of people required?</li> </ul>	Twenty-six permanent jobs will be created during the operational phase of the PV facility, with an expected current value of employment activities of R3.76 million during the first 10 years, 60% of which will accrue to previously disadvantaged individuals.
		<ul style="list-style-type: none"> <li>Salaries offered to employees.</li> </ul>	Salaries offered will be aligned to those paid in the industry for similar skills levels.
		<ul style="list-style-type: none"> <li>Buildings to be constructed on site?</li> </ul>	A control room (20m2), a small office (20 m2), ablution facilities and kitchen area (20 m2), a small workshop (40 m2) and a store of 300 to 400 m2 will be constructed on site.
		<ul style="list-style-type: none"> <li>Who will enforce the environmental management plan?</li> </ul>	An Environmental Management Plan will be compiled as part of the EIA process that will also form part of the Environmental Authorisation. During the construction phase, a dedicated person will be appointed to ensure that all health and safety and environmental management commitments and requirements are implemented. The implementation of the EMP will also be overseen and audited by an independent party, who must report to the DEA. If the developer does not comply with the conditions of the EA and EMP, DEA can stop the project.
		<ul style="list-style-type: none"> <li>Seriousness of ALL impacts on the environment.</li> </ul>	Will be determined during the impact assessment phase of the environmental impact assessment.

Interested and Affected Party	Date of receipt	Issue	Response
		<ul style="list-style-type: none"> <li>How many holes for footings for the solar panels to be drilled and/or dig and then concreted? Huge damage to land and high risk of erosion.</li> </ul>	<p>Steel structures will be used to support the PV modules. There are different options that will be considered, i.e. a fixed or rack structure, a 1-axis tracker (horizontal, vertical or polar axis) and a 2-axis tracker. The current trend is towards rack structures or possibly horizontal single axis trackers because of the superior production rates and cost effectiveness.</p> <p>Depending on the structure or tracker that is selected, a number of foundation options may be considered. For fixed or rack structures, either driven steel piles or small concrete footings are cast in the ground for the foundations. These concrete foundations are typically of the same size as for small buildings. The preferred technology for trackers is the vibratory driven steel pile foundation, however given the hard ground conditions expected on the site; a steel pile in concrete in a pre-drilled hole is the more likely foundation solution. A detailed geotechnical study will be carried out in order to provide data for the selection of the foundation.</p> <p>A large number of holes will be drilled and/or dug and concreted for the footings of the solar panels. These will generate fairly large volumes of gravel that will be used for road construction, if suitable. The holes will be filled with concrete.</p>
		<ul style="list-style-type: none"> <li>How will the land ever be rehabilitated?</li> </ul>	<p>Because dust generated on-site negatively affect the effectiveness of the solar panels. Soil mounds on the site will affect the natural water flows that could damage the infrastructure. The developer will therefore rehabilitate the site as soon as possible after the construction phase and maintain it in a good condition to minimise</p>

Interested and Affected Party	Date of receipt	Issue	Response
			dust and damage to the site infrastructure.
		<ul style="list-style-type: none"> <li>Where will employees be accommodated (after hours)?</li> </ul>	During the construction phase, no personnel, except the security personnel, are allowed to be on site after hours. Construction personnel will be accommodated in the nearby towns of Reivilo and Taung.
Mr Ben-Karel van Aswegen (Portion 2 Farm Kangkatjes 919 HN)	4 August 2014	<ul style="list-style-type: none"> <li>New roads and existing roads. Condition and maintain.</li> </ul>	<p>New access and internal roads shall be constructed as all-weather type, 3m wide with wide, open side drains forming part of the drainage system. These roads will be maintained by the developer.</p> <p>Existing roads (R372) will be maintained during the construction phase to such an extent that it should be in the same condition as it was prior to construction.</p>
		<ul style="list-style-type: none"> <li>Socio-Economic.</li> </ul>	See above answers related to beneficiaries, poaching and cattle theft, veld fires, employment opportunities, accommodation and roads.
		<ul style="list-style-type: none"> <li>Site Security.</li> </ul>	<p>A perimeter fence of 2.4 m weld-mesh or wire and netting fence which is electrified or a double barrier consisting of two 2.4 m high electric fences with only electric strands placed about 2 or more metres apart will be erected. The electrification will be non-lethal. A single 6 m automated sliding gate will be provided for vehicular access as well as a single 1 m wide gate for pedestrians.</p> <p>Furthermore, the perimeter, access points and general site will be monitored by CCTV (closed circuit television) cameras infrared/night vision technology and passive intrusion detection</p>

Interested and Affected Party	Date of receipt	Issue	Response
			systems. The security lighting will be linked to the passive intrusion detection systems, so that it will not be on all night
Mr. Louis Spruyt (Foreman of the farm Brakfontein 897 HN)	25 August 2014	• Veld fires.	No fires will be allowed on the development site for cooking purposes. The PV site will have fire breaks in place as required by law. Fire fighting equipment will also be available in case of veld fires. The applicant will also join the local fire fighting association.
		• Sterilization of cattle due to generation of electricity by PV modules.	To be investigated during the agricultural specialist study.
Mr. Kagiso Piet Botha (Boipelo & Reivilo community representatives)	25 August 2014	• High rate of unemployment – youth and women.	Twenty-six permanent jobs will be created during the operational phase of the PV facility, with an expected current value of employment activities of R3.76 million during the first 10 years, 60% of which will accrue to previously disadvantaged individuals.
Mr and Mrs du Plessis	17 September 2014	• Increase in theft:	Mr Theunis Meyer asked what would be a reasonable solution to this problem. Mr du Plessis responded that more visible policing in the area would suffice.
		• Preparation of food on site:	Mr Theunis Meyer explained that no contractor will be allowed to prepare food on site during any phase of the proposed development.
		• General waste:	The developer will be responsible to remove waste from site to a landfill in the surrounding area.
		• Toilets:	The developer will provide Enviro-loo's. These toilets separate the solid and liquid wastes and will be emptied on a regular basis.

Interested and Affected Party	Date of receipt	Issue	Response
		<ul style="list-style-type: none"> <li>Transport of workers:</li> </ul>	Workers will be transported to and from the development site via busses.
		<ul style="list-style-type: none"> <li>The R372 road:</li> </ul>	The road will be maintained by the developer and left in the condition it was prior to development.
		<ul style="list-style-type: none"> <li>Labour and salaries of workers:</li> </ul>	Skilled labour is required for such a development as proposed and unskilled labour will be sourced from the local communities and not the farming communities.
		<ul style="list-style-type: none"> <li>Floods:</li> </ul>	Mr Meyer explained that he will highlight this issue with the developer as this was not identified as an issue before.
EWT (Claire Patterson-Abrolat)	13 April 2015	<ul style="list-style-type: none"> <li>No specific mention is made regarding avifauna. Recent figures show that birds are colliding with PV panels although the exact reason for this is not yet clear. BirdLife South Africa will be releasing Best Practice Guidelines for avifaunal monitoring at solar facilities in the near future and reference should be made to this document. The Guideline will recommend that an avifaunal specialist is appointed for a ground truthing study and we recommend that you prepare for this requirement in the interim.</li> <li>The EWT would like to see the developer commit to an avifaunal study along with other ecological studies given the current</li> </ul>	<p>The impact of the proposed development on bird species have been highlighted as a potential significant impact.</p> <p>Furthermore, the ecological specialist study has concluded that it is unlikely that any bird species of particular high conservation priority will use the area for breeding or as habitat.</p>



Interested and Affected Party	Date of receipt	Issue	Response
		status of knowledge of the cumulative impact of this development over time.	
SKA South Africa (Dr Adrian Tiplady)	23 June 2014	<ul style="list-style-type: none"> <li>Based on distance to the nearest SKA station, and the information currently available on the detailed design of the PV installation, this facility poses a very low risk of detrimental impact on the SKA;</li> <li>As a result of the very low risk associated with the PV facility, no mitigation measures would be required at this stage. However, the South African SKA Project Office would like to be kept informed of progress with this project, and reserves the right to further risk assessments at a later stage</li> </ul>	No action

## 6 Methodology adopted in assessing the potential impacts that have been identified, including any specialist studies or specialised processes undertaken

*The assessment of potential environmental impacts was done according to the methodology described in the proposed DEAT EIA Guideline 5: Assessment of Alternatives and Impacts. According to this document, assessment of impacts includes:*

- **Identifying and assessing the potential impacts** associated with a proposed activity and its alternatives;
- Predicting the **nature, magnitude, extent and duration** of potentially significant impacts;
- Identifying the **range of mitigation measures** that could be implemented to lessen the impacts of the activity; and
- **Evaluating the significance of residual impacts** i.e. impacts that remain after taking mitigation measures into account.

*The methodology included:*

- A clear process for impact identification, prediction and evaluation;
- Specification of impact identification techniques;
- Criteria for evaluating the significance of impacts;
- The design of mitigation measures to address impacts;
- Defining types of impacts (direct, indirect or cumulative); and
- Specifying uncertainties.

### 6.1 Identification of potential environmental impacts

*Regulation 31 (2) of GN R. 543 states that an EIA report contain all information that is necessary for the competent authority to consider the application and to reach a decision, including a description of environmental issues and potential impacts, including cumulative impacts, that have been identified*

Different types of impacts may occur from the undertaking of an activity. The impacts may be positive or negative and may be categorized as being direct (primary), indirect (secondary) or cumulative impacts.

**Direct impacts** are impacts that are caused 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 quantifiable.

**Indirect impacts** of an activity are indirect or induce changes that may occur as a result of the activity (e.g. reduction of water in a stream that supplies water to a reservoir that supplies 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.

**Cumulative impacts** are 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. discharge 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.

*GN R. 543 defines “cumulative impacts”, in relation to an activity, as the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.*

The identification of the potential impacts of an activity on the environment should include impacts that may occur during the commencement, operation and termination of an activity. In order to identify impacts it is important that the nature of the proposed activity is well understood so that the potential impacts that are associated with the activity can be understood.

The process of identification and assessment of impacts includes the:

- determination of current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- determination of future changes to the environment that will occur if the proposed activity does not take place;
- an understanding of the activity in sufficient detail to understand its consequences; and
- the identification of impacts which are likely to occur if the activity is undertaken.

Potential environmental impacts of the proposed development have been identified during consultative processes between the consultant, the client and some technical specialists based upon their professional experience and judgement. Additional potential environmental impacts were identified during the public participation process.

## **6.2 Description of the method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity**

Impact prediction, or impact forecasting, involves the consideration of physical, biological, socio-economic and cultural information to estimate the likely characteristics and parameters of the impact. The aim of impact prediction is to provide a basis for determining the likely significance of each impact with sufficient accuracy to develop appropriate mitigation measures.

Factors that should be taken into account in impact prediction include:

- the nature of the impact i.e. positive, negative, direct, indirect, cumulative;
- the magnitude of the impact;
- the extent and location of the impact in terms of the area covered, volume distribution, etc;

- when the impact will occur i.e. during construction, operation and/or decommissioning as well as whether the impact will occur immediately or be delayed;
- the duration of the impact;
- the extent to which the impact can be reversed or not;
- the likelihood or probability of the impact actually occurring ; and
- the significance of the impact.

The methods used to predict the characteristics of impacts should always be clearly described to the extent that the competent authority that evaluates the assessment will be able to understand exactly how the predictions were made. The methods include professional judgement, quantitative mathematical models, experiments and physical models, physical or visual simulations or maps (including GIS tools), case studies; and past experience.

The choice of which method to use in a given situation will depend on how significant the impact is likely to be. In general, the more significant an impact is likely to be, the more sophisticated the methods used to predict impacts should be.

#### 6.2.1 Impact assessment methodology

The **first step** in the assessment is to describe the nature of the impact, i.e. a description of what is being affected and how. This is an appraisal of the type of effect the activity would have on the affected environment.

The nature of all the potential environmental impacts, i.e. the type of effect the activity would have on the affected environment, needs to be described. The description includes what is being affected and how it may be affected.

The **second step** is to determine the significance of the described impact.

*GN R. 543 defines —significant impact" as 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.*

*After the impacts of an activity have been predicted and mitigation measures have been determined, the impacts must be evaluated to determine how significant the impacts are likely to be.*

*Key factors that should be considered in evaluating the significance of an impact include:*

- *environmental standards, guidelines and objectives;*
- *level of public concern (including both norms and values); and*
- *scientific and professional evidence of the loss or disruption of valued resource stocks and ecological functions; negative impact on social values, quality of life and livelihood; and foreclosure of land and resource use opportunities.*

*The determination of the significance of an impact should also be based on a methodical approach that includes:*

- *the use of procedures and guidelines established by the competent authority;*
- *the adoption of relevant criteria from comparable cases;*
- *a consistent approach to the comparison of alternatives; and*
- *documenting the reasons for the judgements made.*

*The evaluation of the significance of the impact must always consider the likelihood of the impact eventuating and acceptability of risk. Four other criteria to evaluate whether adverse impacts are significant include considering whether the impact will result in:*

- *environmental loss and deterioration;*
- *social impacts resulting directly or indirectly from environmental change;*
- *non-conformity with environmental standards, objectives and guidelines; and*
- *likelihood and acceptability of risk*

*The environmental significance has been determined through a synthesis of the following assessment criteria:*

- **Extent (spatial scale)**

This has been rated as:

- immediate - where the impact would extend only as far as the activity;
- local - where the impact would be limited to the site and its immediate surroundings;
- regional - where the impact would extend to the region (municipal boundaries); or
- national - where the impact would have an impact on a national scale.

- **Duration**

This has been rated to indicate whether the lifetime of the impact would be:

- short term - where the impact would exist for 0-5 years;
- medium term - where the impact would exist for 5-15 years;
- long term - where the impact will cease after the operational life of the activity either because of natural process or by human intervention; or
- permanent - where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

- **Status and intensity of the impact (severity)**

Here it has been established whether the impact would be destructive or benign and rated as:

- low - where the impact affects the environment in such a way that natural, social and cultural functions and processes are not affected;
- moderate - where the affected environment is altered, but natural, social and cultural functions and processes continue albeit in a modified way; or
- severe - where natural, social and cultural functions or processes are altered to the extent that it will temporarily or permanently cease.
- The ratings have been based on a number of considerations, i.e. the degree to which:
  - the activity, product or service violates the spirit or letter of any law, statute, regulation or authorisation;
  - the activity, product or service affects public health and safety (level of toxicity etc.);
  - the activity, product or service affects the availability or functioning of life support systems or other environmental goods, services and conditions which are considered to be of special or unique character, of limited supply or essentially irreplaceable;
  - the activity, product or service is related to other impacts which individually are insignificant, but could cumulatively result in significant impacts;
  - an activity, product or service may establish a precedent for future actions with significant environmental impacts or represents a decision in principle about an issue with significant implications;
  - the potential impacts of the activity, product or service is highly uncertain or involves unique or unknown risks; and
  - the degree of irreversibility.
- **Probability**

The likelihood of the impact actually occurring has been rated as:

  - improbable - where the possibility of the impact to materialise is very low, either because of design or historic experience;
  - probable - where there is a distinct possibility that the impact will occur;
  - highly probable - where it is most likely that the impact will occur; or
  - definitely - where the impact will occur regardless of any prevention measures.
- **Significance**

The significance of impacts will be determined through a synthesis of the aspects produced, in terms of their nature, duration, intensity, extent and probability and described as:

  - low - where it will not have an influence on the decision;

- medium - where it should have an influence on the decision unless it is mitigated;  
or
- high - where it would influence the decision regardless of any possible mitigation.

### **6.3 Description of the method of assessing cumulative impacts**

Cumulative impacts were considered with specific focus on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the similar sites. Other factors considered were technology and time and space crowding of similar activities

The cumulative impacts of similar proposed developments within in the region is further explained in Section 7.3.

### **6.4 Specialist studies**

A number of specialist studies (Table 1) were undertaken to assist with the identification and assessment of potential impacts, as well as developing mitigation measures.

A summary of the findings and recommendation of the respective specialist studies is given in Table 7, while statements on their expertise and independence can be found in Appendix 3.

The findings and recommendations were used to inform the impact assessment process and/or the Environmental Management Programme.

Table 7: Summary of specialist studies

Agricultural Impact Assessment (L.G. du Pisani, Eduplan cc, Professional contract soils and agricultural specialist) - October 2014	
<b>Findings</b>	<ul style="list-style-type: none"> <li>The long term impact on the agricultural potential and productivity of the proposed Brakfontein PV Solar Energy Facility will be negligible as long as the development adheres to the Environmental Management Plan (EMP) proposed in this report. In the event of the site being made available for livestock production again during the commercial energy production phase of the project, the impact on agricultural production will only be temporary. Even if the site is not utilized for agricultural production during the lifetime of the project the loss of agricultural potential and food production is still considered to be negligible due to the relatively small size of the site (~275ha) and its relatively low grazing and carrying capacities (11 LSU's or 7 medium framed beef cows respectively).</li> <li>The soils on the site are very shallow and have a low susceptibility to both water and wind erosion.</li> <li>The site is very flat with an average slope of the land of less than 1%.</li> <li>There are no agricultural sensitive areas, areas of high agricultural value, wetlands or cultivated lands on the site that shall be interfered with.</li> <li>There are no boreholes, windmills, reservoirs and drinking troughs on the proposed development site or within 500 m there-of.</li> <li>One of the access roads to the site provides access to a neighbouring farm situated to the south of the development site. An alternative road will have to be provided in order for that land owner to access his farm.</li> <li>There is a so called "water vain" or subterranean watercourse running through the site between -27.565078 E X 24.428051 S and -27.592295 E and 24.420983 S. The importance there-of should be assessed and addressed by the Geo-hydrologist's report.</li> <li>The conservation status of the biome within which the site is located is regarded as "least threatened".</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>Prevention and control of water erosion on the site.</li> <li>Care must be taken with the ground cover during and after construction on the site. If it is not possible to retain a good plant cover during construction, technologies should be employed to keep the soil covered by other means, i.e. straw, mulch, erosion control mats, etc., until a healthy plant cover is again established.</li> <li>Care should also be taken to control and contain storm water run-off.</li> <li>Rehabilitate construction sites by establishing it with indigenous grasses like <i>Digitaria eriantha</i>, <i>Eragrostis curvula</i>, <i>Cenchrus ciliaris</i>, <i>Antheophora pubescens</i>, etc.</li> </ul>



	<ul style="list-style-type: none"> <li>• Care should be taken to put gravel on access road surfaces to protect the soil against water erosion, with special care taken with roads positioned on slopes.</li> <li>• Cross mounds and other storm water drainage techniques must be employed to decrease the speed and force of the storm water properly from road surfaces.</li> <li>• Storm water runoff from the roofs of buildings must be contained properly.</li> <li>• Buffer areas around buildings that cannot be rehabilitated with grass, should be covered with gravel and proper storm water runoff control measures should be introduced.</li> <li>• Proper road construction and maintenance</li> <li>• Apply dust control measures, i.e. water spraying.</li> <li>• Vehicles and equipment must be serviced regularly and maintained in a good running condition. All vehicles must be fitted with spill skills. Storage of contaminants must be limited to low quantities and done under strict industry standards.</li> <li>• There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages.</li> <li>• Contingency plans must be in place to deal with spillages</li> </ul>
<b>Heritage Impact Assessment (P Birkholtz, PGS Heritage, Heritage specialist) - October 2014</b>	
<b>Findings</b>	<ul style="list-style-type: none"> <li>• No archaeological or heritage sites were identified within the study area during the fieldwork and desktop study components. As a result no impact is expected on these two aspects. However, the paleontological desktop has revealed that the study area has a Very High paleontological sensitivity.</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• The EAP as well as the ECO for this project must be made aware of the fact that the Ghaap Group sediments contains significant fossil remains, albeit mostly stromatolites and micro-fossil assemblages.</li> <li>• A Qualified palaeontologist must be appointed to do a Phase 1 Paleontological Impact Assessment to confirm the presence if significant fossils of stromatolites and possible cave breccia deposits on this site and to make the necessary recommendations regarding a possible Phase 2 PIA during the construction phase.</li> <li>• These recommendations should form part of the EMP of the project.</li> </ul>
<b>Visual Impact Assessment (Axis Landscape Architects) – November 2014</b>	
<b>Findings</b>	<ul style="list-style-type: none"> <li>• The majority of the study area is considered to have moderate landscape character sensitivity due to the undeveloped and low topographic variation of the landscape, the generally high visual quality and the related</li> </ul>

	<p>tourism value that is placed on the visual resource. Low terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees. It will provide visual screening for the proposed PV Power Station.</p> <ul style="list-style-type: none"> <li>• The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.</li> <li>• Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>• In most cases, the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively.</li> <li>• Rehabilitation of the disturbed areas will prevent the exposure of soil, which may cause a reduction in the visual quality of the study area.</li> <li>• Sensitive positioning of the construction camps and lay-down yards should take advantage of the natural screening capacity of the study area by locating the camps outside of the views of sensitive visual receptors</li> </ul>
<b>Ecological Impact Assessment (Reinier Terblanche) – February 2015</b>	
<b>Findings</b>	<ul style="list-style-type: none"> <li>• Vegetation in fair to disturbed condition is present at the site, though some possible bush encroachment by <i>Acacia mellifera</i> is present in some areas. Establishment of exotic weeds should be monitored, during construction, if the development is approved, and exotic weeds at the site should be eradicated. By no means should exotic declared invaders such as the mesquite tree (<i>Prosopis</i> species), be planted or allowed to establish.</li> <li>• Site is medium ecological sensitivity because of the likely absence of threatened species at the footprint, the unlikely loss of particularly sensitive or unique habitat in the larger area and the likely absence of a unique ecosystem at the footprint proposed for the development.</li> <li>• There is possible pan depression and confirmed presence of a threatened plant species near the proposed footprint. If the development is approved this means that any significant differences run-off resulting from the construction and operation of the proposed footprint should be kept to a minimum.</li> <li>• Owing to the nature and placement of the area allocated for development it is unlikely that connectivity and important conservation corridors in the area would be significantly impacted.</li> </ul>

	<ul style="list-style-type: none"> <li>No loss of particularly sensitive habitat of particular conservation importance is anticipated if the site is developed.</li> <li>Loss of any plant or animal species of particular high conservation priority i.e. threatened or near threatened species, if the site is developed, is highly unlikely.</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>Exotic and invasive plant species should not be allowed to establish, if the development is approved.</li> <li>Rubble or waste that could accompany the construction effort, if the development is approved, should be removed during and after construction.</li> <li>If the development is approved, every effort should be made to confine the footprint to the area allocated for development and have the least possible edge effects on the ecosystem.</li> <li>Contractors must ensure that no mammalian species are disturbed, trapped, hunted or killed during the construction phase.</li> <li>If the development is approved, every effort should be made to confine the footprint to the area allocated for the development and have the least possible edge effects on the surrounding area.</li> </ul>
<b>Phase 1 Palaeontological Impact Assessment (Gideon Groenwald) – January 2015</b>	
<b>Findings</b>	<ul style="list-style-type: none"> <li>The proposed site of the Brakfontein PV Facility is underlain by Vaalian aged dolomite of the Reivilo Formation, Ghaap Group, Transvaal Supergroup.</li> <li>Well-defined stromatolite structures were observed. The potential for finding well-defined stromatolites still remains high during excavation of PV Panel foundations in areas underlain by dolomite.</li> <li>The area has been allocated a moderate Palaeontological significance and the ECO must report the presence of stromatolites where excavations of panel foundations expose fossil-rich beds.</li> </ul>
<b>Recommendations</b>	<ul style="list-style-type: none"> <li>The ECO of the project be informed of the possibility of finding well-defined stromatolite structures in the study area.</li> <li>An application for a collection and destruction permit be made to SAHRA to allow for the collection and destruction of stromatolite structures during excavation of PV panel foundations.</li> <li>If any exceptionally well-defined stromatolites are observed during excavations, the developer must employ a qualified palaeontologist to record these fossils and collect representative samples for further study at an appropriate institute suggested by SAHRA.</li> </ul>

## **7 Description of environmental issues and potential impacts, including cumulative impacts, that have been identified**

### **7.1 Potential environmental impacts**

The following potential environmental impacts (with associated receptors/indicators) have been identified. See also Table 8 for potential environmental impacts:

- Dust generation during construction on site and access roads;
- Machinery and vehicle noise during the construction phase;
- Increase of traffic on the R372 between Taung and Reivilo.
- Biodiversity impact;
  - Vegetation clearance during the construction phase
  - Habitat transformation during construction and operational phases;
  - Impacts on ecological functioning due to the habitat transformation; and
  - Potential of veld fires during the site establishment, construction and operational phases;
- Water related impacts;
  - Water use during the construction and operational phases;
  - Potential surface water pollution due to soil erosion or spillage of pollutants;
  - Potential storm water flooding during the construction phase;
- Temporary sterilisation of land use potential;
- Soil impacts;
  - Soil pollution due to soil or spillage of pollutants during construction and operational phases; and
  - Soil erosion during construction and operational phases;
- Removal, disturbance and or destruction of heritage resources – graves, artefacts on site;
- Visual and aesthetic impacts;
- Social impacts;
  - Negative impact of construction activities on farm workers;
  - Negative impacts of migrant labour during the construction phase on the local communities;
  - Negative impacts of migrant workers on farm security, theft and poaching;
- Socio-economic impacts;
  - Negative socio-economic impacts of veld fires on farming activities;

- Positive impacts of job creation during the construction and operational phases;
- Local sourcing of construction materials during the construction phase.

**Table 8:** Potential environmental impacts associated with the various phases of the proposed development

Environmental medium	Environmental impact	Phase		
		Construction	Operational	Decommissioning
Water	Surface water pollution	X	X	X
	Hydrology	X	X	X
Soil	Soil pollution	X	X	X
	Soil erosion	X	X	X
Air	Air pollution (dust)	X	X	X
	Noise	X		X
Biodiversity	Vegetation clearance	X	X	X
	Terrestrial habitat transformation	X	X	X
	Aquatic habitat transformation (sediment loading)	X	X	X
	Ecological function	X	X	X
	Avifaunal impact (bird collisions)	X	X	X
Land use	Land use potential	X	X	X
	Agricultural production	X	X	X
Social	Negative social impacts	X		X
	Positive social impacts	X	X	
Visual	Visual & aesthetic impacts	X	X	X
Economy	Economic impacts	X	X	X
Traffic	Traffic impacts	X	X	X
Economic		X	X	X

## 7.2 Manner in which the environment may be affected by the proposed activity

The construction of a PV plant normally incorporates some or all of the following activities:

- Protection of natural features by creating no-go areas;
  - Marking identified features;
  - Prevent access to identified features that are to be protected;
- Earthworks;
  - Site clearing
  - Levelling of site;

- Excavations of soil and rock;
- Establishment of storm water management and other services infrastructure;
  - Design of storm water management and other services infrastructure;
  - Construction of storm water management and other services infrastructure;
  - Maintenance of storm water management and other services infrastructure;
- Handling and storage of soil and/or fill material;
  - Excavation and storage of in situ soil;
  - Excavation of soil and/or fill material off-site;
  - Dumping of imported soil and/or fill material on site;
  - Levelling and compaction of site;
- Transportation of bulk materials to, on and from the site;
  - Soil and/or fill material;
  - Hydrocarbon fuels, grease, lube oils and solvents;
  - Cement, concrete and other construction materials;
  - Building rubble and fill material;
  - Other solid and liquid waste;
- Provision and operation of on-site staff facilities and activities;
  - Provision of potable water;
  - Provision and operation of temporary toilets;
- Management of vehicles, machinery and equipment;
  - Construction and maintenance of access road;
  - Operation of construction vehicles, machinery and equipment;
  - Maintenance of construction vehicles, machinery and equipment;
- Handling and use of hazardous materials;
  - Storage and use of hydrocarbon fuels, grease, lube oils & solvents on site;
  - Storage and use of cement;
  - Storage and use of herbicides and pesticides;
- Waste generation, storage and disposal;
  - Temporary storage of solid waste;
  - Temporary storage of liquid waste;
  - Disposal of solid and liquid wastes
- Construction of the PV plant ;

- Construction of foundations;
- Erection of PV solar panels;
- Construction of inverters, concentrator boxes and transformation centre;
- Construction of electrical reticulation and distribution centre;
- Construction of the substation;
- Construction of electricity connection line to the substation;
- Removal of all temporary construction structures and services;

The operation of a PV plant normally incorporates some or all of the following activities:

- Maintenance of PV modules;
- Provision of security;
  - Use of water and electricity;
  - Operation of ablution facilities;
- Provision of fire-fighting services;
- Maintenance of storm water management and supporting infrastructure;
  - Pest and invader plant control;
  - Erosion management
  - Maintenance of fire breaks
- Handling and use of hazardous materials;
  - Storage and use of hydrocarbon fuels, grease, lube oils & solvents on site;
  - Storage and use of cement;
  - Storage and use of herbicides and pesticides;
- Waste generation, storage and disposal;
  - Temporary storage of solid waste;
  - Temporary storage of liquid waste;
  - Disposal of solid and liquid wastes

Some of the above activities are more harmful to the environment than others. Intrusive activities directly impacts on the environment by destroying natural and potential palaeontological features and replacing it with the built feature, while other indirectly affect the environment, but can proceed over extended periods. The bottom line is that the existing natural environment will be replaced by a man-made environment.

Negative environmental impacts will be prevented as far as is reasonably practical, even if it requires a redesign of the proposed facilities. The negative environmental impacts that cannot be prevented will be minimised as far as is reasonably practicable. Whatever natural features remain once the PV plant with its associated infrastructure has been developed, will be rehabilitated.

### **7.3 Cumulative impacts of the proposed development**

At present, no developments of similar nature are located in the proximity of the proposed development site. If such a development is constructed, it would be the first of its kind in the region. Similar applications for the development of solar PV plants are in process for the region (Figure 17).

It must be noted that the potential for cumulative impacts does exist. However, the existing Eskom transmission line's capacity does prevent the construction of more than one solar PV plant in the region. Although cumulative impacts are theoretically possible, at present the practical implementation thereof is not possible. Except if Eskom upgrades the transmission line which is not planned for the near future.



### Solar PV plant applications in the vicinity of the proposed Brakfontein Solar PV plant



**Figure 17:** Similar applications for the development of solar PV plants are in process for the region.  
**Brakfontein Final EIR**

## 8 Environmental Impact Assessment results

The Leopold matrix with the identified environmental impacts associated with the development indicates the potential impacts of the various activities that will be undertaken during the pre-construction site establishment, construction, operational, decommissioning and rehabilitation phases of the project (Table 9). Due to the nature of the project, there is no difference between the potential impacts for the original, unmitigated and the modified, mitigated designs for the project. However, the significance of the impacts for the two designs is expected to be different.

The results of the assessment on the potential environmental impacts associated with the original, unmitigated and the preferred, mitigated development proposal are summarised in impact assessment matrices that include the activities in the pre-construction (site establishment), construction, operational and decommissioning phases of the proposed development (Tables 10 and 11). The impacts are summarised for the environmental components and are not given for the individual indicators. The detail of the assessments for each of the identified potential environmental impacts for both the original, unmitigated and the preferred, mitigated development proposals are also provided (Appendices 4 and 5).

The results of the impact evaluations for the worst case (original, unmitigated design) and the best case (mitigated, modified and preferred design) in the matrices are colour coded to facilitate the visual inspection thereof. Negative impacts have been colour coded in shades of red (low = yellow, medium = orange, high = bright red), positive impacts in shades of green (low = light green, medium = bright green, high = dark green). An overall rating for every individual activity has also been allocated, according to the highest negative impact for the activity. The impacts have also been summarised at the bottom of the matrix in a table indicating high, medium and low significant impacts for negative, positive and negative or positive impacts.

### 8.1 No-go alternative

In the case where the proposed development is not construction little to no environmental impacts will emanate by choosing the 'no-go' alternative. Only 26 potential impacts have been identified and assessed for this alternative. The majority of the impacts (13 or 50%) are negatively related to the creation of job opportunities within the region.

### 8.2 Original unmitigated design and site layout

The construction, operation and decommissioning of a PV facility using the original, unmitigated design and site-layout will result in a total of 303 potential environmental impacts, with 268 (88%) negative and 35 (12%) positive impacts. The original unmitigated design has 70 (23%) low negative impacts, 184 (61%) medium negative and 14 (5%) high negative impacts. On the positive side the original unmitigated design has 9 (3%), Low positive 20 (7%), medium positive and 6 (2%) high positive impacts on the environment.

The majority of the potential negative impacts (143 or 47%) are related to surface water pollution, soil erosion, air pollution, land use potential, habitat loss and visual impacts.

The majority of the potential positive impacts (16 or 5%) are related with the socio-economic impacts of the proposed development.

### **8.3 Preferred, mitigated design and site layout**

The construction, operation and decommissioning of a PV preferred, mitigated design and site-layout will result in a total of 303 potential environmental impacts, with 268 (88%) negative and 35 (12%) positive impacts.

The bulk of the potential negative impacts of the preferred mitigated design are low (76%) and medium (13%) impacts, with 0% highly negative impacts. The majority of the activities which need to be mitigated are related to the potential impacts on surface water, land use and habitat transformation.

**Table 9:** Potential environmental impacts associated with the various phases of the proposed development

IMPACT IDENTIFICATION MATRIX (Brakfontein PV Plant EIA)				Ref no.	A		B		C		D		E		F		G										
<div>Instructions:</div> <div>1. Identify and list all activities, products or services which may have an impact on the elements of the environment (Y-axis).</div> <div>2. List the components of the environment, impacts on the environment and the indicators (X-axis).</div> <div>3. Identify the components and indicators on which the activities, products and services may have an impact on. Indicate with a <b>X</b>.</div>				Components	ABIOTIC																						
				Impacts	Surface water pollution				Ground-water pollution		Modification of Hydrology	Soil erosion	Soil pollution		Air pollution			Land use potential (Grazing capacity and interaction with day to day farming activities)									
PROJECT PHASE	Ref no.	ACTIVITIES, PRODUCTS or SERVICES		Indicators	Turbidity	Sedimentation	Eutrophication	Salinisation	Chemical quality	Other key indicator chemicals	Ecological functioning	Corridor functioning	Affecting underground water table levels	Affecting underground water quality	Flooding	Alteration of flow regime	Surface water run-off	Erosion	Leaching potential	Soil quality	Noise	Dust	Vibration	Light	Emissions/ smoke	On site	
		ACTIVITY,PRODUCT OR SERVICE GROUP	SPECIFIC ACTIVITY. PRODUCT OR SERVICE																								
Site establishment	1	Construction of electric fence to prevent access to site			N											N		N				N	N			N	
	2	Protection of natural features by creating no go areas	Marking identified features (veins) Prevent access to identified features that are to be protected														P	P	P								
	3	Removal of pre-identified biota prior to earthworks	Removal and relocation of pre-identified flora prior to earthworks																								
	4	Handling and storage of soil and/or fill material	Excavation and storage of in situ soil on-site		N												N	N	N		N		N			N	
	Excavation of soil and/or fill material off-site/on-site			N													N	N	N		N		N			N	
	Compacting site			N													N	N	N		N		N			N	
	Dumping of imported soil and/or fill material on site			N													N	N	N		N		N			N	
	5	Construction of access road	Construction and operation of access roads		N												N	N	N		N		N			N	
	6	Earthworks	Levelling of site		N												N	N	N	N		N		N			N
	Excavation of soil and rock			N									N	N			N	N	N	N		N	N	N		N	
	Site clearing			N										N			N	N	N	N		N				N	
	7		Provision and operation of on site staff facilities and activities	Construction of accommodation, temporary toilet, shower & washing, as well as food preparation facilities and eating areas														N	N								N
	Provision of potable water																										
	Operation of temporary toilets				N		N	N						N							N						
	Operation of shower & washing facilities				N		N	N																			
	Use of accommodation				N		N															N			N	N	
	8	Management of vehicles, machinery & equipment	Operation of construction vehicles, machinery & equipment																								
	Maintenance of construction vehicles, machinery & equipment						N							N						N	N	N			N		
	9	Transportation of bulk materials on-site	Soil and/or fill material																N		N	N	N	N	N	N	
	Hydrocarbon fuels, grease, lube oils and solvents						N							N					N	N	N	N	N	N	N		
Cement						N													N		N	N	N	N			
Construction material																			N		N	N	N	N			
Builders rubble																			N		N	N	N	N			
Hazardous waste							N												N		N	N	N	N			
General solid & liquid waste (domestic waste)							N											N	N	N	N	N	N	N			
10	Handling, use and spillage of hazardous materials	Storage and use of hydrocarbon fuels, grease, lube oils and solvents on site												N					N	N					N		
Storage and use of cement														N						N	N	N	N		N		
Storage and use of herbicides and pesticides														N						N					N		
11	Solid waste management, storage and disposal	Domestic and industrial																		N						N	
12	Liquid waste management	Shower and washing effluents												N						N						N	
Chemical toilet effluents														N										N	N		
Sewage disposal														N										N	N		
Food preparation effluents																					N				N		
Effluents from wash bays & workshops														N							N				N		
Contaminated water on site																					N				N		

IMPACT IDENTIFICATION MATRIX (Brakfontein PV Plant EIA)				Ref no.	H	I	J	K							L	M	N	O	P	Q												
<div>Instructions:</div> <div>1. Identify and list all activities, products or services which may have an impact on the elements of the environment (Y-axis).</div> <div>2. List the components of the environment, impacts on the environment and the indicators (X-axis).</div> <div>3. Identify the components and indicators on which the activities, products and services may have an impact on. Indicate with a X.</div>				Components	BIOTIC														SOCIO-ECONOMIC													
				Impacts	Natural resource use			Species/habitat loss (Flora)	Species/habitat disturbances (Fauna)	Habitat transformation							Heritage and Archeology		Socio-Economic Impacts		Economic impact	Visual impact	Infrastructural impacts		Traffic impacts							
PROJECT PHASE	Ref no.	ACTIVITIES, PRODUCTS or SERVICES		Indicators	Water	Soil & concrete	Energy (coal, diesel)			Terrestrial vegetation	Riparian vegetation	Aquatic invertebrates	Terrestrial invertebrates	Amphibians	Reptiles	Birds	Small mammals	Ecological functioning	Corridor functioning/fragmentation	Heritage	Archaeological/Paleontological	Cultural	Land use of site	Conservation	Hygiene, health and fire	Economic impact	Visual impact	Sewage	Electricity	Water supply	Traffic volumes	
		ACTIVITY,PRODUCT OR SERVICE GROUP	SPECIFIC ACTIVITY, PRODUCT OR SERVICE																													
Site establishment	1	Construction of electric fence to prevent access to site			N	N	N	N	N			N	N	N	N	N				N						P	N		N			
	2	Protection of natural features by creating no go areas	Marking identified features (veins)					P	P	P			P	P	P	P	P							P								
			Prevent access to identified features that are to be protected					P	P	P			P	P	P	P	P							P								
	3	Removal of pre-identified biota prior to earthworks	Removal and relocation of pre-identified flora prior to earthworks																					P								
			Excavation and storage of in situ soil on-site					N	N	N			N	N	N	N	N										N				N	
			Excavation of soil and/or fill material off-site/on-site					N	N	N			N	N	N	N	N										N				N	
			Compacting site					N	N	N			N	N	N	N	N															
			Dumping of imported soil and/or fill material on site					N	N	N			N	N	N	N	N										N				N	
	5	Construction of access road	Construction and operation of access roads					N	N	N											N					P	N					
			Levelling of site					N	N	N			N	N	N	N	N				N		N				N					
			Excavation of soil and rock					N	N	N			N	N	N	N	N				N		N				N					
			Site clearing					N	N	N			N	N	N	N	N				N		N				N					
			Construction of accommodation, temporary toilet, shower & washing, as well as food preparation facilities and eating areas					N	N	N			N	N	N	N	N						N	N			N	N	N	N	N	
			Provision of potable water																													
			Operation of temporary toilets		N			N	N	N								N	N				N	N				N				N
			Operation of shower & washing facilities		N																		N	N				N				N
			Use of accommodation																					N	N			N	N	N	N	N
			Use of food preparation facilities & eating areas																					N	N			N	N	N		
	8	Management of vehicles, machinery & equipment	Operation of construction vehicles, machinery & equipment		N		N																			N		N				N
			Maintenance of construction vehicles, machinery & equipment		N																					N		N		N	N	
			Soil and/or fill material																									N				N
			Hydrocarbon fuels, grease, lube oils and solvents										N														N		N			N
			Cement			N							N														N		N			N
			Construction material			N																					N		N			N
			Builders rubble																								N		N			N
			Hazardous waste																								N		N			N
		General solid & liquid waste (domestic waste)																								N		N			N	
		Storage and use of hydrocarbon fuels, grease, lube oils and solvents on site										N	N	N	N	N									N		N					
		Storage and use of cement										N	N	N	N	N									N		N					
		Storage and use of herbicides and pesticides										N	N	N	N	N	N								N		N					
11	Solid waste management, storage and disposal	Domestic and industrial										N	N	N	N	N	N								N	N		N				
		Shower and washing effluents		N								N	N	N	N	N	N								N	N		N				
		Chemical toilet effluents		N								N	N	N	N	N	N								N	N		N				
		Sewage disposal		N								N	N	N	N	N	N								N	N		N		N		
		Food preparation effluents		N								N	N	N	N	N	N								N	N		N				
		Effluents from wash bays & workshops		N								N	N	N	N	N	N								N	N		N				
		Contaminated water on site		N								N	N	N	N	N	N								N	N		N				

<div>Instructions:</div> <div>1. Identify and list all activities, products or services which may have an impact on the elements of the environment (Y-axis).</div> <div>2. List the components of the environment, impacts on the environment and the indicators (X-axis).</div> <div>3. Identify the components and indicators on which the activities, products and services may have an impact on. Indicate with a X.</div>				Components		ABIOTIC																						
				Impacts		Surface water pollution					Ground-water pollution		Modification of Hydrology		Soil erosion	Soil pollution	Air pollution			Land use potential (Grazing capacity and interaction with day to day farming activities)								
PROJECT PHASE	Ref no.	ACTIVITIES, PRODUCTS or SERVICES		Indicators	Turbidity	Sedimentation	Eutrophication	Salinisation	Chemical quality	Other key indicator chemicals	Ecological functioning	Corridor functioning	Affecting underground water table levels	Affecting underground water quality	Flooding	Alteration of flow regime	Surface water run-off	Erosion	Leaching potential	Soil quality	Noise	Dust	Vibration	Light	Emissions / smoke	On site		
		ACTIVITY,PRODUCT OR SERVICE GROUP	SPECIFIC ACTIVITY, PRODUCT OR SERVICE																									
Construction phase	13	Handling and storage of soil and/or fill material	Excavation and storage of in situ soil		N												N	N	N		N	N	N	N	N	N	N	
	Excavation of soil-and/or fill material off-site			N													N	N	N		N	N	N	N	N	N	N	
	Dumping of imported soil and/or fill material on site			N														N	N	N		N	N	N	N	N	N	N
	14	Establishment of stormwater drainage and other services infrastructure	Construction of culverts, pipeline and associated infrastructure, and the maintenance of infrastructure		N								N				N	N	N			N	N	N	N	N	N	
	Construction of foundations												N	N				N	N	N			N	N	N	N	N	
	15	Construction of PV facility	Erection of PV solar panels										N	N				N	N		N	N	N	N	N	N	N	
	Construction of inverters, concentration boxes, and transformation centre																	N	N		N	N	N	N	N	N	N	
	16	Construction of electrical infrastructure	Inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes		N									N				N	N		N	N	N	N	N	N	N	
																										N		
	17	Construction of electrical connection line to the substation																N	N								N	
																											N	
	18	Removal of all temporary construction structures & services after completion of construction				N												N	N								N	
																											N	
	19	Management of vehicles, machinery & equipment	Operation of construction vehicles, machinery & equipment						N										N			N	N	N	N	N	N	N
			Movement of heavy vehicles, machinery & equipment on site																N			N	N	N	N	N	N	N
			Maintenance of construction vehicles, machinery & equipment							N												N	N	N	N	N	N	N
	20	Transportation of bulk materials on-site	Soil and/or fill material																N	N		N	N	N	N	N	N	N
			Hydrocarbon fuels, grease, lube oils and solvents						N					N							N	N	N	N	N	N	N	N
			Cement						N												N	N	N	N	N	N	N	N
			Construction material																			N	N	N	N	N	N	N
			Builders rubble																			N	N	N	N	N	N	N
	21	Handling, use and spillage of hazardous materials	Hazardous waste																			N	N	N	N	N	N	N
			General solid & liquid waste (domestic waste)																			N	N	N	N	N	N	N
Storage of hydrocarbon fuels, grease, lube oils and solvents on site								N										N								N	N	
Use of hydrocarbon fuels, grease, lube oils & solvents on site								N						N								N	N			N	N	
Storage and use of cement									N												N	N		N	N		N	
22	Solid waste management, storage and disposal	Hazardous waste																		N	N					N		
Domestic waste																				N	N				N	N		
Construction waste																				N	N				N	N		
23	Liquid waste management	Waste recycling						N									N	N	N				N				N	
		Shower and washing effluents						N						N							N	N					N	
		Chemical toilet effluents						N													N	N					N	
		Removal of sewage						N													N	N					N	
		Food preparation effluents																			N	N					N	
		Effluents from wash bays & workshops						N													N	N					N	
Operational phase		Contaminated water on site						N						N							N	N					N	
		Energy															N	N								N		
		Maintenance of PV Modules																					P			P		
		Operation of on-site facilities for operational staff																										
		Maintenance of supporting infrastructure																										
		Pest and invader plant control																						P			P	
Decommissioning and Rehabilitation		Handling and use of hazardous material	Storage and use of hydrocarbon fuels, grease, lube oils and solvents on site																		N	N					N	
		Temporary storage of solid waste																										
		Temporary storage of liquid waste																										
		Disposal of solid and liquid waste																										
		Removal of structures (buildings, PV panels, power lines etc.)	Levelling of site			N													N	N	N		N	N			N	
		Excavations																	N	N	N		N	N			N	

**Table 10:** Significance of the environmental impacts for the original, unmitigated PV plant design

			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q		
			Water			Soil		Air	Land use	Consumption	Biodiversity			Social							
			Surface water pollution	Ground water impact	Hydrology modification	Soil erosion	Soil pollution	Air pollution	Land use potential	Natural resource use	Species/ habitat loss (flora)	Species/ habitat loss (fauna)	Habitat transformation	Heritage/ archaeological impact	Socio-economic impact	Economic impact	Visual and aesthetic impact	Infrastructural impacts	Traffic impact		
#		Activity																			
1	SE	Construction of electric fence to prevent access to site	Low N		Low N	Medium N		Low N	Medium N	Low N	Low N	Low N	Low N	Medium N		Low P	Medium N	Medium N		13	
2	SE	Protection of natural features by creating no go areas			Medium P	Medium P					Medium P	Medium P	Medium P		Medium P					6	
3	SE	Removal of pre-identified biota prior to earthworks													Medium P					1	
4	SE	Handling and storage of soil and/or fill material	Medium N		Medium N	Medium N	Low N	Medium N	Medium N		Medium N	Medium N	Low N				Medium N		Medium N	11	
5	SE	Construction of access road	Medium N		Medium N	Low N	Medium N	Medium N	Medium N		Medium N	Medium N	Medium N	Medium N	Low P		Low N			12	
6	SE	Earthworks	Medium N	Low N	Medium N	Medium N	Medium N	Medium N	Medium N		Medium N	Medium N	Low N	Medium N			Medium N			12	
7	SE	Provision and operation of on site staff facilities and activities	Medium N	Low N	Low N		Medium N	Medium N	Low N	Low N	Medium N	Medium N	Low N		Medium N		Medium N	High N	Medium N	14	
8	SE	Management of vehicles, machinery & equipment	Medium N	Low N		Medium N	Medium N	Medium N	Medium N	Low N					Low N		Low N	Medium N	Medium N	11	
9	SE	Transportation of bulk materials on-site	High N	Low N		Low N	Medium N	Medium N		Low N		Medium N			High N		Medium N		Medium N	10	
10	SE	Handling, use and spillage of hazardous materials	High N	Medium N			Medium N	Medium N	Medium N			Low N	Low N		High N		Low N			9	
11	SE	Solid waste management, storage and disposal	Medium N				Medium N		Medium N		Medium N	Medium N	Low N		Medium N		Medium N			8	
12	SE	Liquid waste management	High N	Medium N			Medium N	Medium N	Medium N	Low N			Low N		Medium N		Low N	Medium N		10	
13	C	Handling and storage of soil and/or fill material	Medium N		Medium N	Medium N	Medium N	Medium N	Medium N		Medium N	Medium N	Low N		Medium N		Medium N			11	
14	C	Establishment of stormwater drainage and other services infrastructure	High N	Low N	Medium N	Medium N		Medium N	Medium N		Medium N	Medium N	Low N			Low P	Medium N			11	
15	C	Construction of PV facility		Medium N	Medium N	Medium N	Medium N	Medium N	Medium N	Medium N	Medium N	Medium N	Medium N		High N	High P	Medium N	Medium N	Medium N	15	
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)			Medium N				Medium N	Low N	Medium N	Medium N	Low N			Medium P	Medium N	Low N	Medium N	10	
17	C	Construction of electrical connection line to the substation			Low N	Medium N		Medium N	Medium N	Low N	Medium N	Medium N	Low N		Low P	Medium P		Low N	Medium N	12	
18	C	Removal of all temporary construction structures & services after completion of construction	Low N			Medium N	Low N	Medium N	Low N			Low N					Low N		Medium N	8	



		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
		Water			Soil		Air	Land use	Consumption	Biodiversity			Social					
		Surface water pollution	Ground water impact	Hydrology modification	Soil erosion	Soil pollution	Air pollution	Land use potential	Natural resource use	Species/ habitat loss (flora)	Species/ habitat loss (fauna)	Habitat transformation	Heritage/ archaeological impact	Socio-economic impact	Economic impact	Visual and aesthetic impact	Infrastructural impacts	Traffic impact
#	Activity																	
19	C Management of vehicles, machinery & equipment	Medium N			Medium N	Medium N	Medium N	Medium N	Low N		Medium N	Low N		Low N		Low N		
20	C Transportation of bulk materials on-site	High N	Low N		Low N	Medium N	Medium N				Medium N			High N		Medium N		Medium N
21	C Handling, use and spillage of hazardous materials	Medium N	Medium N			Medium N	Medium N	Medium N			Low N	Low N		High N		Low N		
22	C Solid waste management, storage and disposal	Medium N		Low N		Medium N	Medium N	Medium N	Low P	Medium N	Medium N	Low N		Medium N		Medium N		
23	C Liquid waste management	High N	Medium N			Medium N	Medium N	Medium N	Low N					Medium N		Low N		
24	Op Generation of electricity - operation of PV plant			Medium N	Medium N		Medium P	Medium N	High P	Medium N	Medium N	Medium N			High P		High P	
25	Op Maintenance of PV Modules								Medium N						Low P		Medium N	
26	Op Operation of on-site facilities for operational staff	Medium N	Low N		Medium N	Medium N			Low N								High N	
27	Op Maintenance of supporting infrastructure														Low P			
28	Op Pest and invader plant control	Medium N			Medium P	Medium P		Medium P				Medium P		Medium P	Low P			
29	Op Handling and use of hazardous material	High N	Medium N			Medium N		Medium N			Medium N	Low N		Medium N				
30	Op Waste	Medium N	Medium N			Medium N				Medium N				Medium N				
31	De Removal of structures (buildings, PV panels, power lines etc.)	Medium N	Low N	Medium N	Medium N		Medium N	Medium N			Medium N	Low N		Medium N	Medium P		Medium N	Medium N
32	De Replanting of indigenous vegetation	Medium N		Medium P	Medium N	Low N	Low P	High P	Low N	Medium P	Medium P	High P		Medium P			Medium N	
33	De Waste management, storage and disposal	Medium N	Low N			Medium N	Low N	Medium N		Low N		Medium N		Medium N		Medium N		
Total		25	16	15	19	23	23	25	15	17	23	23	3	23	10	21	12	10
Low N		2	9	4	3	3	2	2	11	2	4	16	0	2	0	8	2	0
Medium N		16	7	9	14	19	19	21	2	13	17	4	3	10	0	13	7	10
High N		7	0	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0
Low P		0	0	0	0	0	1	0	1	0	0	0	0	2	5	0	0	0
Medium P		0	0	2	2	1	1	1	0	2	2	2	0	4	3	0	0	0
High P		0	0	0	0	0	0	1	1	0	0	1	0	0	2	0	1	0

**Table 11:** Significance of the environmental impacts for the mitigated, preferred PV plant design

			Environmental impact																	
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
			Water			Soil		Air	Land use	Consumption	Biodiversity			Social						
#	Stage	Activity	Surface water pollution	Ground water impact	Hydrology modification	Soil erosion	Soil pollution	Air pollution	Land use potential	Natural resource use	Species/ habitat loss (flora)	Species/ habitat loss (fauna)	Habitat transformation	Heritage/ archaeological impact	Socio-economic impact	Economic impact	Visual and aesthetic impact	Infrastructural impacts	Traffic impact	
1	SE	Construction of electric fence to prevent access to site	Low N		Low N	Low N		Low N	Low N	Low N	Low N	Low N	Low N	Medium N		Medium P	Low N	Medium N		13
2	SE	Protection of natural features by creating no go areas			Medium P	Medium P					Medium P	High P	High P		High P					6
3	SE	Removal of pre-identified biota prior to earthworks													High P					1
4	SE	Handling and storage of soil and/or fill material	Low N		Low N	Low N	Low N	Low N	Low N		Low N	Low N	Low N				Low N		Low N	11
5	SE	Construction of access road	Medium N		Low N	Low N	Low N	Low N	Low N		Low N	Low N	Low N	Medium N	Low P		Low N			12
6	SE	Earthworks	Medium N	Low N	Low N	Low N	Low N	Low N	Low N		Low N	Low N	Low N	Medium N			Low N			12
7	SE	Provision and operation of on site staff facilities and activities	Low N	Low N	Low N		Low N	Low N	Low N	Low N	Low N	Low N	Low N		Low N		Low N	Medium N	Low N	14
8	SE	Management of vehicles, machinery & equipment	Low N	Low N		Low N	Low N	Low N	Low N	Low N					Low N		Low N	Low N	Low N	11
9	SE	Transportation of bulk materials on-site	Medium N	Low N		Low N	Low N	Low N		Low N		Low N			Low N		Low N		Low N	10
10	SE	Handling, use and spillage of hazardous materials	Medium N	Medium N			Low N	Low N	Medium N			Low N	Low N		Low N		Low N			9
11	SE	Solid waste management, storage and disposal	Low N				Low N		Medium N		Low N	Low N	Low N		Low N		Low N			8
12	SE	Liquid waste management	Medium N	Medium N			Low N	Low N	Medium N	Low N			Low N		Low N		Low N	Medium N		10
13	C	Handling and storage of soil and/or fill material	Low N		Low N	Low N	Low N	Low N	Low N		Low N	Low N	Low N		Low N		Low N			11
14	C	Establishment of stormwater drainage and other services infrastructure	Medium N	Low N	Low N	Low N		Low N	Low N		Low N	Low N	Low N			Medium P	Low N			11
15	C	Construction of PV facility		Low N	Low N	Low N	Low N	Medium N	Medium N	Low N	Low N	Medium N	Low N		Low N	High P	Low N	Medium N	Low N	15
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)			Low N				Low N	Low N	Low N	Low N	Low N			Medium P	Low N	Low N	Low N	10
17	C	Construction of electrical connection line to the substation			Low N	Low N		Low N	Low N	Low N	Low N	Low N	Low N		Low P	Medium P		Low N	Low N	12
18	C	Removal of all temporary construction structures & services after completion of construction	Low N			Low N	Low N	Low N	Low N			Low N					Low N		Low N	8

			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
			Water			Soil		Air	Land use	Consumption	Biodiversity			Social						
			Surface water pollution	Ground water impact	Hydrology modification	Soil erosion	Soil pollution	Air pollution	Land use potential	Natural resource use	Species/ habitat loss (flora)	Species/ habitat loss (fauna)	Habitat transformation	Heritage/ archaeological impact	Socio-economic impact	Economic impact	Visual and aesthetic impact	Infrastructural impacts	Traffic impact	
#	Stage	Activity																		
19	C	Management of vehicles, machinery & equipment	Low N			Low N	Low N	Medium N	Low N	Low N		Low N	Low N		Low N		Low N			10
20	C	Transportation of bulk materials on-site	Medium N	Low N		Low N	Low N	Medium N				Low N			Low N		Low N		Low N	9
21	C	Handling, use and spillage of hazardous materials	Medium N	Medium N			Low N	Low N	Low N			Low N	Low N		Medium N		Low N			9
22	C	Solid waste management, storage and disposal	Low N		Low N		Low N	Low N	Low N	Low P	Low N	Low N	Low N		Low N		Low N			11
23	C	Liquid waste management	Medium N	Low N			Low N	Low N	Low N	Low N					Low N		Low N			8
24	Op	Generation of electricity - operation of PV plant			Low N	Low N		High P	Medium N	High P	Low N	Medium N	Medium N			High P		High P		10
25	Op	Maintenance of PV Modules								Medium N						Medium P		Medium N		3
26	Op	Operation of on-site facilities for operational staff	Low N	Low N		Low N	Low N			Low N								Medium N		6
27	Op	Maintenance of supporting infrastructure														Low P				1
28	Op	Pest and invader plant control	Low N			Medium P	Medium P		High P				High P		High P	Low P				7
29	Op	Handling and use of hazardous material	Medium N	Medium N			Low N		Low N			Low N	Low N		Low N					7
30	Op	Waste	Low N	Low N			Low N				Low N				Low N					5
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Low N	Low N	Low N	Low N		Medium N	Low N			Low N	Low N		Low N	Medium P		Medium N	Low N	12
32	De	Replanting of indigenous vegetation	Low N		High P	Low N	Low N	Low P	High P	Low N	Medium P	High P	High P		High P			Medium N		12
33	De	Waste management, storage and disposal	Low N	Low N			Low N	Low N	Low N		Low N		Low N		Low N		Low N			9
Total			25	16	15	19	23	23	25	15	17	23	23	3	23	10	21	12	10	
Low N			15	12	13	17	22	17	18	12	15	19	19	0	16	0	21	3	10	
Medium N			10	4	0	0	0	4	5	1	0	2	1	3	1	0	0	8	0	
High N			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Low P			0	0	0	0	0	1	0	1	0	0	0	0	2	2	0	0	0	
Medium P			0	0	1	2	1	0	0	0	2	0	0	0	0	6	0	0	0	
High P			0	0	1	0	0	1	2	1	0	2	3	0	4	2	0	1	0	

## 9 Conclusion

Although the number of impacts between the unmitigated and mitigated is the same, the significance thereof differs vastly. The preferred mitigated design has only 39 (13%) potential medium negative impacts, whereas the unmitigated design has 184 (61%) potential medium negative impacts. Furthermore, the preferred mitigated design allows for 17 (6%) potential high positive impacts in relation with the 6 (2%) potential high positive impacts of the unmitigated design.

### 9.1 Evaluation of alternatives and trade-offs

It seems clear from the above discussion that any development undertaken on the proposed site for the PV Plant development will certainly have negative environmental impacts, due to the fact that the natural vegetation and consequently grazing potential of the site will be largely modified or destroyed, there are a number of stromatolite features present on and around the site which needs attention if unearthed.

It is therefore critical that any development activity undertaken on the site would have to take special cognisance thereof, in order to observe the general duty of care principle captured in South African environmental legislation.

Given the low potential for alternative land uses, including agriculture and the low ecological significance of the proposed development site, it seems clear that although the no-go alternative would prevent further negative environmental impacts on the site, it will also preclude the economic opportunities for the surrounding communities associated with the proposed development.

Although the impact evaluation of the baseline case and modified (mitigated) PV power plants do not indicate large differences in the potential negative environmental impacts of these alternatives, the negative environmental impacts of the preferred, modified development proposal are definitely less than those of the original, unmitigated design baseline case. Almost 5% of all potential environmental impacts assessed for the original, unmitigated development proposal were assessed as highly significant and 61% as medium significant, i.e. they would influence the decision to allow the development to proceed.

In contrast, 0% of the potential environmental impacts assessed for the preferred, mitigated development proposal would result in impacts influencing the decision to proceed, while nearly 13% of the activities for this development option would result in potential medium significant negative environmental impacts on one or more of the environmental components considered. It is thus clear that the preferred option has a much lower potential to have a significant environmental impacts on the receiving environment.

The difference in potential significant environmental impacts can be ascribed to the wisdom gained from the specialist studies and public participation process, which informed the planning and design processes and resulted in a preferred, mitigated development proposal that differs fundamentally from the original proposal.

The design of the proposed development has allowed the developer (proponent) to achieve the following with regard to the design and site lay-out of the preferred development proposal:

- Incorporation of the micro depressions for natural surface water flow and;
- reduced visibility of the proposed development.

Although some environmental concerns were addressed in the preferred, mitigated development proposal, a number of residual impacts will be addressed through the environmental management programmes (separate to this report) that will be developed for the site establishment and construction, operational and decommissioning phases of the development.

## **9.2 Difficulties, limitations, uncertainties and implications for decision-making**

The major difficulties experienced in this evaluation are related to the uncertainties that had to be examined. Due to the nature of such a technical project, there are still a large number of micro-design aspects (technological design of PV modules) that have not been finalised, as well as details of the numerous specific activities that will be undertaken, i.e. specifics of the construction methods. In this regard, efforts were made to improve the level of detail of those aspects and activities related to potential medium or highly significant environmental impacts.

Another difficulty faced during the environmental impact process was the limitation of information with regards to the biodiversity of the Ghaap Plateau. Most of the biodiversity information was sourced during the ecological survey and assessment

## 10 Environmental Impact Statement

If the development is authorised, the existing natural environment will be replaced by a man-made environment with some natural features. This EIA has found that the undertaking of the proposed preferred, mitigated development option that includes the site establishment, construction, operation and decommissioning of the 75 MW PV plant and supporting infrastructure, covering approximately 250 ha will have the following environmental impacts:

- Destruction or modification of the agricultural land use potential of the site;
- Potential increased soil erosion problems, due to increased surface water run-off from hardened surfaces, most probably of lesser quality than before from the natural vegetation;
- Destruction of partially disturbed Ghaap Plateau Vaalbosveld vegetation and wildlife habitats;
- Potential electrocution of bird species that may collide with overhead power lines;
- Potential destruction of archaeological and palaeontological features which includes stromatolites;
- Visual disturbance of the surrounding areas and;
- Increased traffic movement and altered traffic patterns on the roads in the vicinity of the development.

However, the EIA has also identified the following positive impacts of the proposed development;

- The development will contribute to service infrastructure in the Taung and Reivilo area;
- The PV facility will benefit society in general by alleviating the pressure of electricity generation from coal in a small way and also contributing to the government's target for renewable energy and reducing the harmful environmental consequences from generating electricity from coal.

Given the comprehensive study undertaken by the developer and all the inputs made by specialists in the EIA and design process, the EAP is of the professional opinion that the activity should be authorised on the following conditions:

- The Environmental Management Programmes for the site establishment, construction and operational phases must be implemented after these have been expanded and elaborated upon by considering the Generic standard and Detailed environmental specifications attached to this report (Appendices 1 and 2);
- The environmental management programmes for site establishment, construction and operational phases must be reviewed and updated as necessary to serve as up to date working documents;

## 11 Environmental Management Programme

*Once the impacts have been identified and predicted, appropriate mitigation measures need to be established. Mitigation measures are the steps that are taken to reduce the identified impacts as far as possible. Mitigation measures should address the predicted factors of the impacts clearly to demonstrate how the impacts will be reduced through mitigation. The objectives of mitigation are to:*

- *find more environmentally sound ways of doing things;*
- *enhance the environmental benefits of a proposed activity;*
- *avoid, minimise or remedy negative impacts; and*
- *ensure that residual negative impacts are within acceptable levels.*

*The mitigation of impacts should be organised in a hierarchy of actions namely:*

- *Firstly, avoid negative impacts as far as possible through the use of preventative measures;*
- *Secondly, minimise or reduce negative impacts to —as low as practicable levels; and*
- *Thirdly, remedy or compensate for negative residual impacts which are unavoidable and cannot be reduced further.*

The following sections provide a description of the EMPs for this project. It starts by setting the scene in terms of the status of the EMP in relation to the EIA process. Thereafter the principles guiding the EMP are presented, followed by the institutional arrangements for its implementation. This is followed by a description of the contents of the EMPs for the construction and operational phases respectively.

### 11.1 Setting the scene

Previous sections described the different activities and their potential impacts. The EMP is a requirement of the EIA process and aims to link these activities and identified potential impacts to management actions and interventions.

The competent authority has the freedom to accept the proposed EMP ‘in full’ or ‘partially’ and can also include additional aspects. Whatever the decision on the EMP, it needs to be reflected in the environmental authorisation (EA) and therefore becomes legally binding on the proponent (developer). The developer will have to provide a budget for the implementation of the EMP and DEA will be required to verify compliance to the conditions of the environmental authorisation. It is proposed that EMP audits be conducted by independent, external auditors every six months during the construction phase and annually during operational phase. The aim of such audits will be to check environmental legal compliance and verify compliance to the EA and EMP, as well as to submit copies of such reports to DEA for their records.



## 11.2 EMP Principles

The EMP had to deal with development proposals and design which are still in a conceptual phase. This resulted in varied levels of detail pertaining to different aspects. To deal with the conceptual nature of the proposal, the EMP had to develop overall environmental management principles to guide decision making and actions. These are the following:

- **Principle 1:** Appropriate measures must be implemented to attenuate storm water generated on-site and control the release thereof over extended periods to prevent the occurrence of erosion. Such measures should also provide for facilities to screen all run-off water in order to prevent the release of litter originating from the site with the storm water into the catchment.
- **Principle 2:** Appropriate rehabilitation measures must be implemented to ensure maximum vegetation cover.
- **Principle 3:** The preferred design must retain the micro depressions on site to maintain the natural surface water flow.
- **Principle 4:** *Training and awareness* will be ongoing requirements for contractors during construction and for tenants and the public during operations.
- **Principle 5:** Continual *monitoring and auditing* will be central to the management of the PV Plant. Technical specialists will conduct regular monitoring programmes, while registered auditors will conduct audits against environmental legal requirements and the EMP.

## 11.3 EMP for the pre-construction, construction and operational phases

The EMPs for the site establishment and construction, operational and decommissioning phases (separate to this report) of the PV plant were generated from the issues identified during the detailed assessment of potential environmental impacts that may arise from the development of the PV Plant. The EMPs must be read in conjunction with the Environmental Impact Report (EIR) and the specialist studies conducted as part of the assessment process in order to effectively achieve the EMP objectives.

***Important note:***

***It needs to be stressed that the EMP focuses on addressing specific identified significant environmental impacts pertaining to the development. It must serve as the basis for a more detailed, expanded and elaborated EMP after considering the Generic standard and Detailed environmental specifications attached to this report (Draft Environmental Management Programme) and should be a working document, setting management objectives, action and interventions when detailed construction methods and agreements with contractors are finalised.***

The impact reference number refers to the activities listed in Tables 10 and 11 and the correlating environmental medium that it may impact. For instance, the impact reference

number D6 refers to the potential erosion problems associated with the construction of the access road. The management objective is the overall objective that must be achieved in order to effectively manage the respective impacts. Targets are set to indicate the preferred outcome of the EMP and the achievement of these targets are also an indication of the level to which the objectives are achieved. The management actions and interventions is the methodologies that must be utilised to mitigate impacts in order to ultimately achieve the objectives of the EMP. Responsible persons are allocated to ensure that the EMP conditions are met. A timeframe is given for monitoring and the specific must take place to indicate extent to which the objectives have been met and a person is also allocated to monitor the progress on achieving the objectives.

## **12 Appendices**

**Appendix 1:** Acceptance of final scoping report from the DEA (19-03 2015).



## environmental affairs

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### PER EMAIL / MAIL

Dear Mr Meyer

#### ACCEPTANCE OF THE SCOPING REPORT FOR THE PROPOSED CONSTRUCTION OF A PHOTOVOLTAIC SOLAR POWER STATION WITH ITS ASSOCIATED INFRASTRUCTURE ON THE FARM BRAKFORTEIN 897 HN NEAR TAUNG WITHIN THE GREATER TAUNG LOCAL MUNICIPALITY IN THE WEST PROVINCE

The Scoping Report (SR) and Plan of Study for Environmental Impact Assessment (PoSEIA) dated December 2014 and received by this Department on 05 December 2014 refer.

This Department has evaluated the submitted SR and the PoSEIA dated December 2014 and is satisfied that the document complies with the minimum requirements of the Environmental Impact Assessment (EIA) Regulations, 2010. The SR is hereby accepted by the Department in terms of Regulation 30(1)(a) of the EIA Regulations, 2010.

You may proceed with the EIA process in accordance with the tasks contemplated in the PoSEIA and the requirements of the EIA Regulations, 2010.

All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAR) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAR and Environmental Management Programme (EMPr).

Please ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAR. This includes but is not limited to the North West Department of Economic Development, Environment, Conservation and Tourism (NWDC), the Department of Agriculture, Forestry and Fisheries (DAFF) and provincial Department of Agriculture, the South African Civil Aviation Authority (SACAA), the Department of Transport, the Local Municipality, the District Municipality, the Department of Water and Sanitation (DWS), the Department of Communications, SENTECH, Eskom Holdings SOC Limited, the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), EWT, Birdlife

- vi. The EIA must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 on the EIA information required for solar energy facilities below.
- vii. The EIA must provide the four corner's coordinates for the proposed development site (note that if the site have numerous bend points, each and every bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.
- viii. The EIA must provide the following:
  - Clear indication of the envisioned area for the proposed solar energy facility; i.e. placing of photovoltaic panels and all associated infrastructure should be mapped at an appropriate scale.
  - Clear description of all associated infrastructure. This description must include, but not limited to the following:
    - Power lines;
    - Internal roads infrastructure;
    - All supporting onsite infrastructure such as laydown area, guard house and control room etc. and
    - All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation.
- ix. The EIA must also include a comments and response report in accordance with Regulation 28(m) of the EIA Regulations, 2010.
- x. The EIA must include the detail inclusive of the PPP in accordance with Regulation 54 of the EIA Regulation.
- xi. Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.
- xii. An Avifaunal Assessment must be conducted to determine the impacts that the proposed activity (including the powerline) may have on avifauna. Mitigation measures must be proposed and included in the EIA and the EMP.
- xiii. Should a Water Use License be required, proof of application for a license needs to be submitted.
- xiv. Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.
- xv. The EIA must provide a detailed description of the need and desirability, not only providing motivation on the need for clean energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites.
- xvi. A copy of the final site layout map. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following:
  - PV positions and its associated infrastructure;
  - Permanent laydown area footprint;
  - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
  - Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
  - The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure;
  - Substation(s) and/or transformer(s) sites including their entire footprint;
  - Connection routes (including pylon positions) to the distribution/transmission network;
  - All existing infrastructure on the site, especially roads;
  - Buffer areas;

- Buildings, including accommodation; and
  - All "no-go" areas.
- xvii. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- xviii. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.
- xix. A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to:

**Postal Address:**

Department of Environmental Affairs  
Private Bag X447  
Pretoria  
0001

**Physical address:**

Environment House  
473 Steve Biko Road  
Pretoria  
0083

For Attention: Muhammad Essop  
Integrated Environmental Authorisations  
Strategic Infrastructure Developments  
Telephone Number: (012) 399 9406  
Email Address: MEssop@environment.gov.za

The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:

- i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.
- ii. The final site layout map.
- iii. Measures as dictated by the final site layout map and micro-siting.
- iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.
- vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
- vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.
- viii. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of

construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

- ix. An open space management plan to be implemented during the construction and operation of the facility.
- x. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- xi. A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment.
- xii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
- xiii. A fire management plan to be implemented during the construction and operation of the facility.
- xiv. An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
- xv. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.
- xvi. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

The EIA must include a **cumulative impact assessment** of the facility if there are other similar facilities in the region. The specialist studies e.g. biodiversity, visual, noise etc. must also assess the facility in terms of potential cumulative impacts. The specialist studies as outlined in the PoSEIA which is incorporated as part of the SR must also assess the facility in terms of potential cumulative impacts.

Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.

You are hereby reminded that should the EIA fail to comply with the requirements of this acceptance letter, the EIA will be rejected.

The applicant is hereby reminded to comply with the requirements of Regulation 67 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 56 and 57 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in Regulation 56(3a-3h).

Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8)

of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr.

You are requested to submit two (2) electronic copies (CD/DVD and two (2) hard copies of the EIAr to the Department as per Regulation 34(1)(b) of the EIA Regulations, 2010.

Please also find attached information that must be used in the preparation of the EIAr. This will enable the Department to speedily review the EIAr and make a decision on the application.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Yours faithfully

  
Mr Sabelo Malaza  
Chief Director: Integrated Environmental Authorisations  
Department of Environmental Affairs  
Date: 19/03/2015

cc:	Mr KT Gabana	Greater Taung Local Municipality	Tel: (053) 994 9400	Email: Gabana@vodamail.co.za
	Mr C Berrington	Brakfontein Solar Power Plant (Pty) Ltd.	Tel: (021) 461 3382	Email: charlie@ae-amd.co.za



**A. EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES****1. General site information**

The following general site information is required:

- Descriptions of all affected farm portions
- 21 digit Surveyor General codes of all affected farm portions
- Copies of deeds of all affected farm portions
- Photos of areas that give a visual perspective of all parts of the site
- Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)
- Solar plant design specifications including:
  - Type of technology
  - Structure height
  - Surface area to be covered (including associated infrastructure such as roads)
  - Structure orientation
  - Laydown area dimensions (construction period and thereafter)
  - Generation capacity
- Generation capacity of the facility as a whole at delivery points

This information must be indicated on the first page of any Scoping or EIA document. It is also advised that it be double checked as there are too many mistakes in the applications that have been received that take too much time from authorities to correct.

**2. Sample of technical details for the proposed facility**

Component	Description / dimensions
Height of PV panels	
Area of PV Array	
Number of inverters required	
Area occupied by inverter / transformer stations / substations	
Capacity of on-site substation	
Area occupied by both permanent and construction laydown areas	
Area occupied by buildings	
Length of internal roads	
Width of internal roads	
Proximity to grid connection	
Height of fencing	
Type of fencing	

**3. Site maps and GIS information**

Site maps and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)

- A status quo map/layer must be provided that includes the following:
  - Current use of land on the site including:
    - Buildings and other structures
    - Agricultural fields
    - Grazing areas
    - Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
    - Critically endangered and endangered vegetation areas that occur on the site
    - Bare areas which may be susceptible to soil erosion
    - Cultural historical sites and elements
  - Rivers, streams and water courses
  - Ridgelines and 20m continuous contours with height references in the GIS database
  - Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs
  - High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
  - Buffer zones (also where it is dictated by elements outside the site):
    - 500m from any irrigated agricultural land
    - 1km from residential areas
  - Indicate isolated residential, tourism facilities on or within 1km of the site
- A slope analysis map/layer that include the following slope ranges:
  - Less than 8% slope (preferred areas for PV and infrastructure)
  - between 8% and 12% slope (potentially sensitive to PV and infrastructure)
  - between 12% and 14% slope (highly sensitive to PV and infrastructure)
  - steeper than 18 % slope (unsuitable for PV and infrastructure)
- A site development proposal map(s)/layer(s) that indicate:
  - Foundation footprint
  - Permanent laydown area footprint
  - Construction period laydown footprint
  - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
  - River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
  - Substation(s) and/or transformer(s) sites including their entire footprint.
  - Cable routes and trench dimensions (where they are not along internal roads)
  - Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM)
  - Cut and fill areas at PV sites along roads and at substation/transformer sites indicating the expected volume of each cut and fill
  - Borrow pits
  - Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
  - Buildings including accommodation

With the above information authorities will be able to assess the strategic and site impacts of the application.

#### 4. Regional map and GIS information

The regional map and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - roads including their types (tarrd or gravel) and category (national, provincial, local or private)
  - Railway lines and stations
  - Industrial areas
  - Harbours and airports
  - Electricity transmission and distribution lines and substations
  - Pipelines
  - Waters sources to be utilised during the construction and operational phases
  - A visibility assessment of the areas from where the facility will be visible
  - Critical Biodiversity Areas and Ecological Support Areas
  - Critically Endangered and Endangered vegetation areas
  - Agricultural fields
  - Irrigated areas
  - An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams

#### 5. Important stakeholders

Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Any application, documentation, notification etc. should be forwarded to the following officials:

Ms Mashudu Marubini  
Delegate of the Minister (Act 70 of 1970)  
E-mail: MashuduMa@daff.gov.za  
Tel 012- 319 7619

Ms Thoko Buthelezi  
AgriLand Liaison office  
E-mail: ThokoB@daff.gov.za  
Tel 012- 319 7634

All hardcopy applications / documentation should be forwarded to the following address:

Physical address:  
Delpen Building  
Cnr Annie Botha and Union Street  
Office 270  
Attention: Delegate of the Minister Act 70 of 1970

Postal Address:

Department of Agriculture, Forestry and Fisheries  
Private Bag X120  
Pretoria  
0001  
Attention: Delegate of the Minister Act 70 of 1970

In addition, comments must be requested from Eskom regarding grid connectivity and capacity.  
Request for comment must be submitted to:

Mr John Geeringh  
Eskom Transmission  
Megawatt Park D1Y38  
PO Box 1091  
**JOHANNESBURG**  
2000

Tel: 011 516 7233  
Fax: 086 661 4064  
John.geeringh@eskom.co.za

**B. AGRICULTURE STUDY REQUIREMENTS**

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point
  - Soil colour
  - Limiting factors
  - Clay content
  - Slope of the site
  - A detailed map indicating the locality of the soil forms within the specified area.
  - Size of the site
- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)
- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map.

**C. ASTRONOMY GEOGRAPHIC ADVANTAGE ACT, 2007 (ACT NO. 21 OF 2007)**

The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province excluding the Sol Plaatje Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), MeerKAT and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that had to be protected.

You are requested to indicate the applicability of the Astronomy Geographic Advantage Act, Act No. 21 of 2007 on the application in the BAR/EIR. You must obtain comments from the Southern African Large Telescope (SALT) if the proposed development is situated within a declared astronomy advantage area.

**Appendix 2:** Copy of letter sent to all I&APs, informing them of the availability of the Final EIR report for review.



 NORTH-WEST UNIVERSITY  
YUNIBESITHI YA BOKONE-BOPHIRIMA  
NOORDWES-UNIVERSITEIT  
POTCHEFSTROOM CAMPUS  
Internal Box 150, Private Bag X6001, Potchefstroom,  
South Africa 2520  
**Centre for Environmental Management**  
Tel: +27 (0) 18 299-1588  
Fax: +27 (0) 18 299-4266  
Email: 20801114@nwu.ac.za  
Web: www.nwu.ac.za/cem

17 April 2015

Various Registered Interested and Affected Parties for  
Brakfontein Solar PV plant

Verskeie Geregistreerde Geïnteresseerde en  
Geaffekteerde Partye vir Brakfontein sonkrag stasie

Good day/Goeie dag

**Proposed Brakfontein Solar PV plant EIA: A availability of the Draft Environmental Impact  
Assessment Report (EIR) for public comment**

**Voorgestelde Brakfontein fotovoltaïese kragstasie OIB: Besikbaarheid van konsep  
Omgewingsimpakbepalingsverslag vir publieke kommentaar**

**DEA reference number: 14/12/16/3/3/2/731**

Brakfontein Solar PV Plant Pty (Ltd) recently applied to the Department of Environmental Affairs for environmental authorisation for the construction of a solar PV plant, on/at the farm Brakfontein 897 HN in the vicinity of the towns Reivilo and Taung in the North West Province. An Environmental Impact Assessment process is currently under way before the Application for Environmental Authorisation and the Environmental Management Programme can be considered by the Department. The final scoping report has been accepted by the DEA on 19 March 2015.

Please be informed that the draft Environmental Impact Report is available for public review from 21 April 2015 to 22 May 2015. Hard copies of the Draft EIR are available from the Greater Taung Local Municipality (Mrs Makhumo Mothoa Tel: 053 994 9453) as well as from the Reivilo Cooperation (Mrs Simone de Villiers Tel: 071 908 0645). A hard copy is available on request. Please contact Mr Jurie Moolman below to gain access to the electronic copy.

As a registered I&AP you are invited to study the Final EIR and submit any comments by 22 May 2015 to Mr Jurie Moolman, Centre for Environmental Management, Private Bag X6001, Potchefstroom, 2520 or fax: 018 299 4266 or e-mail 20035551@nwu.ac.za.

Brakfontein Solar Power Plant (Pty) Ltd beplan om 'n Fotovoltaïese (PV) sonkragaanleg met 'n kapasiteit om 75 MW elektrisiteit op te wek, asook geassosieerde infrastruktuur soos paaie en 'n kraglyn. Die ontwikkeling sal 'n gebied van ongeveer 250 hektaar beslaan op die plaas Brakfontein 897 HN naby Taung in die Noordwes Provinsie (S27.584966°, E024.417409°).

'n Omgewingsimpakbepalingsproses word tans gevolg voordat die Omgewingsmagtiging en Omgewingsbestuursprogram oorweeg en uitgereik kan word. Die finale Omgewingsimpakstudiebestekverslag is aanvaar deur die Departement van Omgewingsake op 19 Maart 2015.

Neem asseblief kennis dat die konsep Omgewingsimpakbepalingsverslag vanaf 21 April 2015 tot 22 Mei 2015 beskikbaar is vir kommentaar. 'n Harde kopie van die verslag is beskikbaar by die Greater Taung Local Municipality (Me Makhumo Mothoa Tel: 053 994 9453) asook die Reivilo Koöperasie (Me Simone de Villiers Tel: 071 908 0645). Kontak asb vir Mr Jurie Moolman soos onder aangedui indien 'n elektroniese kopie verlang word.

As 'n geregistreerde geïnteresseerde en geïmpakteerde party is u welkom om die verslag te bestudeer en enige kommentaar teen 22 Mei 2015 te stuur aan Mr Jurie Moolman, Sentrum vir Omgewingsbestuur, Privaatsak X 6001, Potchefstroom, 2520 of faks na: 018 299 4266 of e-pos na [20035551@neu.ac.za](mailto:20035551@neu.ac.za).

Yours sincerely

Die uwe



Theunis Meyer

Pri. Sci. Nat.

SENTRUM VIR OMGEWINGSBESTUUR



**Appendix 3:** Details of specialists involved in specialists studies and declaration of interest



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA


### DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

File Reference Number:	(For official use only)
NEAS Reference Number:	12/12/20/
Date Received:	DEAT/EIA/

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

### PROJECT TITLE

Proposed Brakfontein Solar PV Project : Agricultural Potential and Soil - Impact Assessment Report

Specialist:	Dr L G du Pisani
Contact person:	Dr L G du Pisani
Postal address:	P O Box 34291, NEWTON PARK 6055
Postal code:	5900
Telephone:	0413655030
E-mail:	ldupisani@gmail.com
Professional affiliation(s) (if any)	SACNASP (Pr. Sci. Nat. Agric. Sci. 400178/12)

Project Consultant:	Centre for Environmental Management
Contact person:	Theunis Meyer
Postal address:	Private Bag X6001, POTCHEFSTROOM
Postal code:	2520
Telephone:	018 299 1467
E-mail:	Theunis.Meyer@nwu.ac.za

4.2 The specialist appointed in terms of the Regulations.

I, Louis George du Pisani, declare that –

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

Name of company (if applicable):

30 Oktober 2014

Date:



**environmental affairs**

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA


**DETAILS OF SPECIALIST AND DECLARATION OF INTEREST**

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

**PROJECT TITLE**

**PROPOSED CONSTRUCTION OF A PHOTOVOLTAIC POWER STATION AND ASSOCIATED INFRASTRUCTURE ON THE FARM BRAKFontein 879 HN BETWEEN TAUNG AND REIVILLO IN THE NORTH WEST PROVINCE**

Specialist:	Visual specialist		
Contact person:	Gerhard Griesel		
Postal address:	316 Cheverny, La Montagne, Pretoria		
Postal code:	0184	Cell:	0834156260
Telephone:		Fax:	0866728375
E-mail:	gerhard@axisla.co.za		
Professional affiliation(s) (if any)	South African Council for Landscape Architects		


Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations\_

I, Gerhard Griesel, declare that –

General declaration:

I act as the independent specialist in this application  
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant  
I declare that there are no circumstances that may compromise my objectivity in performing such work;  
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;  
I will comply with the Act, regulations and all other applicable legislation;  
I have no, and will not engage in, conflicting interests in the undertaking of the activity;  
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;  
all the particulars furnished by me in this form are true and correct; and  
I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

  
\_\_\_\_\_  
Signature of the specialist:

Axis Landscape Architects  
\_\_\_\_\_  
Name of company (if applicable):

01 September 2014  
\_\_\_\_\_  
Date:



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA


### DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEAVEIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

- (1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and
- (2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

### PROJECT TITLE

Brakfontein Solar PV

Specialist:	Dr Gideon Groenewald		
Contact person:	Gideon		
Postal address:	P.O. Box 360, Clarens		
Postal code:	9707	Cell:	082 339 9202
Telephone:		Fax:	
E-mail:	1davidgroenewald@gmail.com		
Professional affiliation(s) (if any)	GSSA, PSSA, Pr Sci Nat		

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations\_

I, Gideon Groenewald, declare that – General declaration:

I act as the independent specialist in this application;  
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;  
I declare that there are no circumstances that may compromise my objectivity in performing such work;  
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;  
I will comply with the Act, Regulations and all other applicable legislation;  
I have no, and will not engage in, conflicting interests in the undertaking of the activity;  
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority, and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;  
all the particulars furnished by me in this form are true and correct; and  
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

  
\_\_\_\_\_  
Signature of the specialist:

\_\_\_\_\_  
Name of company (if applicable):

8 March 2015

\_\_\_\_\_  
Date:



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA


### DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

### PROJECT TITLE

--

Specialist:  
Contact person:  
Postal address:  
Postal code:  
Telephone:  
E-mail:  
Professional  
affiliation(s) (if any)

Reinier F Terblanche		
Reinier Terblanche		
PO Box 20488, NOORDBRUG		
2522	Cell:	082 614 6684
082 614 6684	Fax:	
reinierf.terblanche@gmail.com		
SACNASP Reg. No. 400244/05		

Project Consultant:  
Contact person:  
Postal address:  
Postal code:  
Telephone:  
E-mail:

	Cell:	
	Fax:	

  
17 Apr. 2015



4.2 The specialist appointed in terms of the Regulations\_

I, Reinier F Terblanche \_\_\_\_\_, declare that –

General declaration:

I act as the independent specialist in this application  
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant  
I declare that there are no circumstances that may compromise my objectivity in performing such work;  
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;  
I will comply with the Act, regulations and all other applicable legislation;  
I have no, and will not engage in, conflicting interests in the undertaking of the activity;  
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;  
all the particulars furnished by me in this form are true and correct; and  
I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:



Reinier F. Terblanche

Name of company (if applicable):

Date:

17 Apr 2015

**Appendix 4:** Completed impact assessment matrices for 17 identified environmental impacts for the original unmitigated PV power plant design

**Brakfontein PV Plant Worst case impact evaluation**

<b>A. Surface water pollution</b>											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Probable	Low	Medium	Medium	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment	Immediate	Short	Indirect	Negative	Highly probable	Low	Impossible	High	Medium N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	High N
10	SE	Handling, use and spillage of hazardous materials	Immediate	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	High N
11	SE	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Medium N
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	High N
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Regional	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	High N
15	C	Construction of PV facility									
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	High	Medium N
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	High N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Medium N
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	High N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Local	Long	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Negative	Probable	Low	Low	Medium	Medium N
29	Op	Handling and use of hazardous material	Immediate	Long	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	High N
30	Op	Waste	Local	Long	Indirect	Positive	Highly probable	Low	Medium	Medium	Medium N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N

**Nature:** Increased silt loading as a result of soil disturbance activities, leading to increased turbidity & sedimentation  
Increased chemical concentrations in surface water, containing hydrocarbons and other contaminants.

B. Ground water pollution											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Low	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Local	Long	Indirect	Negative	Probable	Low	Impossible	Medium	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material	Local	Long	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
30	Op	Waste	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N

**Nature:** Contamination and degradation of the soil, and in effect ground water, due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site

C. Modification of hydrology											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Indirect	Negative	Probable	Low	Impossible	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Long	Indirect	Positive	Definitely	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
6	SE	Earthworks	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Definitely	Moderate	Medium	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Probable	Low	High	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Probable	Low	High	Medium	Low N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Probable	Moderate	Impossible	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Highly probable	Moderate			Medium P
33	De	Waste management, storage and disposal									

**Nature:** Increase in volumes of water released off the site following storm events, as a result of the increase in impervious surfaces

D Soil erosion											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity		Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Permanent	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
2	SE	Protection of natural features by creating no go areas	Local	Long	Indirect	Positive	Definitely	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Medium N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Low	Medium N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Low	Medium N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Probable	Low	Low	Medium	Medium N
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Indirect	Negative	Definitely	Moderate	Medium	Medium	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Immediate	Long	Indirect	Negative	Highly probable	Low	Medium	Medium	Medium N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Indirect	Positive	Highly probable	Moderate			Medium P
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
33	De	Waste management, storage and disposal									

**Nature:** Soil erosion on construction sites during and after the construction phase due to decreased vegetation cover and increased water run-off  
Soil erosion along the trenches dug during and after the construction phase due to decreased vegetation cover and increased water run-off  
Soil erosion in the area surrounding the workshop area  
Soil erosion due to digging of trenches for underground cabling

D Soil erosion											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity		Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Permanent	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
2	SE	Protection of natural features by creating no go areas	Local	Long	Indirect	Positive	Definitely	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Medium N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Low	Medium N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Low	Medium N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Probable	Low	Low	Medium	Medium N
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Indirect	Negative	Definitely	Moderate	Medium	Medium	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Immediate	Long	Indirect	Negative	Highly probable	Low	Medium	Medium	Medium N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Indirect	Positive	Highly probable	Moderate			Medium P
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Medium N
33	De	Waste management, storage and disposal									

**Nature:**

Soil erosion on construction sites during and after the construction phase due to decreased vegetation cover and increased water run-off  
 Soil erosion along the trenches dug during and after the construction phase due to decreased vegetation cover and increased water run-off  
 Soil erosion in the area surrounding the workshop area  
 Soil erosion due to digging of trenches for underground cabling

F. Air pollution											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Highly probable	Low	Low	High	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
5	SE	Construction of access road	Local	Short	Direct	Negative	Definitely	Moderate	Medium	High	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Local	Short	Direct	Negative	Highly probable	Low	Medium	Low	Medium N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	High	Medium N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	High	Medium N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
23	C	Liquid waste management	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
24	Op	Generation of electricity - operation of PV plant	National	Long	Indirect	Positive	Definitely	Moderate			Medium P
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Permanent	Indirect	Positive	Definitely	Moderate			Low P
33	De	Waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Low	High	Low N

**Nature:** Noise and vibration due to machinery/processes/equipment/vehicles employed during construction/operational activities  
Dust/fumes generated/released during the earthworks/construction activities  
Smoke/gaseous emissions due to machinery/processes/equipment/vehicles employed during construction/operational activities  
Light emitted at night due to construction/operational activities



H. Natural resource use											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Local	Medium	Indirect	Negative	Highly probable	Low	Impossible	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Positive	Highly probable	Low			Low P
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
24	Op	Generation of electricity - operation of PV plant	National	Long	Indirect	Positive	Definitely	High			High P
25	Op	Maintenance of PV Modules	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
26	Op	Operation of on-site facilities for operational staff	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
33	De	Waste management, storage and disposal									

Nature: Fuel usage (fossil fuel reserves)

Water usage

I. Species/habitat loss (Flora)											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity		Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Low	Low	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Long	Direct	Positive	Highly probable	High			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
5	SE	Construction of access road	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Highly probable	Low	Impossible	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Medium N
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Direct	Negative	Highly probable	Low	Medium	Low	Medium N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Highly probable	Low	Low	Low	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Medium N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Direct	Negative	Highly probable	Low	Low	Low	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste	Local	Long	Indirect	Negative	Highly probable	Low	Medium	Medium	Medium N
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Highly probable	Low			Medium P
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Low	Medium	Medium	Low N

**Nature:** Loss of indigenous species as a result of the spreading of alien and invasive plants  
Vegetation clearance during site establishment and construction phases  
Loss of vegetation due to contamination of habitat

		J. Species/habitat disturbance/loss (Fauna)									
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Potential to		
									Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Low	Low	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Permanent	Direct	Positive	Highly probable	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
5	SE	Construction of access road	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Low	Medium N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Low	Medium	Low N
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Medium N
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Medium N
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Medium N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Medium N
20	C	Transportation of bulk materials on-site	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Low	Medium N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Medium N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material	Local	Long	Direct	Negative	Probable	Low	Low	Medium	Medium N
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Highly probable	Moderate			Medium P
33	De	Waste management, storage and disposal									

**Nature:** Electrification of larger birds  
Collisions of larger birds, including vulnerable Blue Cranes and Busards, with powerlines  
Displacement of species due to habitat destruction  
Changes in invertebrate species and diversity as a result of changes in the temperature regime below panels

K. Habitat Transformation											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Definitely	Low	Medium	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Long	Direct	Positive	Definitely	Low			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
5	SE	Construction of access road	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Definitely	Low	Medium	Medium	Low N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
12	SE	Liquid waste management	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Definitely	Low	Low	Low	Low N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Definitely	Low	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Definitely	Low	Low	Medium	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Definitely	Low	Low	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Direct	Negative	Definitely	Low	Low	Low	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Positive	Definitely	Low			Medium P
29	Op	Handling and use of hazardous material	Local	Long	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Definitely	Low			High P
33	De	Waste management, storage and disposal	Local	Permanent	Indirect	Negative	Highly probable	Low	Medium	Medium	Medium N

**Nature:** Loss of plant species as a consequence of modification of vegetation and soils  
Loss of animal species due to transformation of habitat  
Loss of animal species due to deaths as a result of construction/operational activities

L. Heritage/Archaeological resources											
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
6	SE	Earthworks	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility									
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal									

**Nature:** Destruction of archaeological artifacts and knapping sites  
Destruction of railway siding  
Destruction of dry packed walling  
Destruction of fossils during excavations

**M. Socio-Economic Impacts (cultural, land use of site, conservation, hygiene, health and fire)**

#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas	Local	Long	Direct	Positive	Definitely	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks	Local	Long	Direct	Positive	Highly probable	Moderate			Medium P
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road	Regional	Short	Direct	Positive	Highly probable	Moderate			Low P
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Regional	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment	Immediate	Short	Direct	Negative	Highly probable	Low	Low	High	Low N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	High N
10	SE	Handling, use and spillage of hazardous materials	Immediate	Short	Direct	Negative	Highly probable	Moderate	Impossible	High	High N
11	SE	Solid waste management, storage and disposal	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Medium N
12	SE	Liquid waste management	Immediate	Short	Direct	Negative	Definitely	Moderate	Low	High	Medium N
13	C	Handling and storage of soil and/or fill material	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Regional	Short	Indirect	Negative	Probable	High	Low	High	High N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Positive	Highly probable	Moderate			Low P
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment	Immediate	Short	Direct	Negative	Highly probable	Low	Low	High	Low N
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	High N
21	C	Handling, use and spillage of hazardous materials	Immediate	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	High N
22	C	Solid waste management, storage and disposal	Regional	Short	Indirect	Negative	Definitely	Moderate	Impossible	Low	Medium N
23	C	Liquid waste management	Immediate	Short	Indirect	Negative	Definitely	Moderate	Low	High	Medium N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Positive	Definitely	Moderate			Medium P
29	Op	Handling and use of hazardous material	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
30	Op	Waste	Regional	Long	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Definitely	Moderate			Medium P
33	De	Waste management, storage and disposal	Local	Permanent	Indirect	Negative	Probable	Low	Low	Medium	Medium N

**Nature:**

Creation of temporary and permanent employment opportunities  
Benefit the local community indirectly through benefits associated with the provision of accommodation, catering and local spending by contractors  
Generation of renewable energy - benefit society in general  
Conservation of natural features by creating no-go areas and revegetating disturbed areas  
Potential hygiene impacts due to water contamination  
The construction and operation of the facility will affect the land-use of the area

N. Economic impact											
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H		Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Potential to Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Regional	Short	Direct	Positive	Definitely	Moderate	Impossible	Low	Low P
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure	Regional	Short	Direct	Positive	Definitely	Moderate			Low P
15	C	Construction of PV facility	Regional	Short	Direct	Positive	Definitely	Moderate			High P
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Regional	Short	Direct	Positive	Definitely	Moderate			Medium P
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Positive	Definitely	Moderate			Medium P
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	National	Long	Direct	Positive	Definitely	High			High P
25	Op	Maintenance of PV Modules	Regional	Long	Direct	Positive	Highly probable	Moderate			Low P
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure	Regional	Long	Direct	Positive	Highly probable	Moderate			Low P
28	Op	Pest and invader plant control	Regional	Long	Direct	Positive	Highly probable	Low			Low P
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Regional	Short	Direct	Positive	Highly probable	Low			Medium P
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal									

O. Visual & Aesthetic Impacts											
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Moderate	Medium	Medium	Medium N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Medium	Medium	Medium N
5	SE	Construction of access road	Local	Short	Direct	Negative	Probable	Moderate	Medium	High	Low N
6	SE	Earthworks	Local	Short	Direct	Negative	Probable	Moderate	Medium	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Highly probable	Moderate	Medium	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Medium N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
11	SE	Solid waste management, storage and disposal	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Medium N
12	SE	Liquid waste management	Immediate	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Probable	Low	Low	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Regional	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
23	C	Liquid waste management	Immediate	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal	Regional	Permanent	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N

**Nature:**

Visual contrast caused by clearance of vegetation  
 Visual disturbance caused by construction activities  
 Visual disturbance caused by large number of solar panels  
 Visual intrusion of ancillary buildings and structures on views of highly sensitive visual receptors  
 Visual intrusion caused by additional powerlines in the viewshed  
  
 Glint and glare from solar arrays and other features, including buildings windows and roofs, cause visual intrusion on views of sensitive visual receptors



**P. Infrastructural Impacts (sewage, electricity and water supply)**

#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Moderate	Low	Low	Medium N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	High N
8	SE	Management of vehicles, machinery & equipment	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Medium N
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Low N
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	National	Long	Direct	Positive	Definitely	High			High P
25	Op	Maintenance of PV Modules	Local	Long	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
26	Op	Operation of on-site facilities for operational staff	Regional	Long	Direct	Negative	Definitely	Low	Low	Medium	High N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Regional	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Low	Medium N
33	De	Waste management, storage and disposal									

**Nature:** Pressure on regional water and electricity supply

Pressure on local sanitation

**Q. Traffic Impacts**

#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
8	SE	Management of vehicles, machinery & equipment	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
18	C	Removal of all temporary construction structures & services after completion of construction	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Regional	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal									

**Nature:** Deterioration of road infrastructure during construction activities  
Disruption of traffic due to construction activities  
Increased traffic volumes and related negative impacts, i.e. congestion, noise, accidents etc.  
Negative impact of increased traffic volumes on surrounding farming communities

**Appendix 5:** Completed impact assessment matrices for 17 identified environmental impacts for the preferred PV power plant design

**Brakfontein PV Plant Best case impact evaluation**

<b>A. Surface water pollution</b>											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Probable	Low	Medium	Medium	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Immediate	Short	Indirect	Negative	Highly probable	Low	Impossible	High	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
10	SE	Handling, use and spillage of hazardous materials	Immediate	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
11	SE	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Low N
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Regional	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
15	C	Construction of PV facility									
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	High	Low N
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Low N
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Local	Long	Direct	Negative	Highly probable	Low	Low	Medium	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Negative	Probable	Low	Low	Medium	Low N
29	Op	Handling and use of hazardous material	Immediate	Long	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
30	Op	Waste	Local	Long	Indirect	Positive	Highly probable	Low	Medium	Medium	Low N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Low N
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N

**Nature:** Increased silt loading as a result of soil disturbance activities, leading to increased turbidity & sedimentation  
Increased chemical concentrations in surface water, containing hydrocarbons and other contaminants.

B. Ground water pollution											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Low	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Low N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Local	Long	Indirect	Negative	Probable	Low	Impossible	Medium	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material	Local	Long	Indirect	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
30	Op	Waste	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N

**Nature:** Contamination and degradation of the soil, and in effect ground water, due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site

C. Modification of hydrology											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Indirect	Negative	Probable	Low	Impossible	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Long	Indirect	Positive	Definitely	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Definitely	Moderate	Medium	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Probable	Low	High	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Probable	Low	High	Medium	Low N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Probable	Moderate	Impossible	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Highly probable	Moderate			High P
33	De	Waste management, storage and disposal									

**Nature:** Increase in volumes of water released off the site following storm events, as a result of the increase in impervious surfaces

D Soil erosion											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity		Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Permanent	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Long	Indirect	Positive	Definitely	Moderate			Medium P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	High	Low N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Low	Low N
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Low	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Low	Low N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Probable	Low	Low	Medium	Low N
20	C	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Moderate	Medium	Medium	Low N
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Indirect	Negative	Definitely	Moderate	Medium	Medium	Low N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Immediate	Long	Indirect	Negative	Highly probable	Low	Medium	Medium	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Indirect	Positive	Highly probable	Moderate			Medium P
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Low	Medium	Low N
33	De	Waste management, storage and disposal									

**Nature:**

Soil erosion on construction sites during and after the construction phase due to decreased vegetation cover and increased water run-off  
 Soil erosion along the trenches dug during and after the construction phase due to decreased vegetation cover and increased water run-off  
 Soil erosion in the area surrounding the workshop area  
 Soil erosion due to digging of trenches for underground cabling

E Soil pollution											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
5	SE	Construction of access road	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Immediate	Short	Direct	Negative	Highly probable	Moderate	Low	High	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Direct	Negative	Highly probable	Moderate	Low	High	Low N
10	SE	Handling, use and spillage of hazardous materials	Immediate	Short	Direct	Negative	Highly probable	Moderate	Low	High	Low N
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
12	SE	Liquid waste management	Immediate	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Probable	Low	High	High	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N
20	C	Transportation of bulk materials on-site	Local	Short	Direct	Negative	Highly probable	Moderate	Low	High	Low N
21	C	Handling, use and spillage of hazardous materials	Immediate	Short	Direct	Negative	Highly probable	Moderate	Low	High	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
23	C	Liquid waste management	Immediate	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff	Local	Long	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Positive	Definitely	Moderate			Medium P
29	Op	Handling and use of hazardous material	Immediate	Long	Direct	Negative	Highly probable	Moderate	Low	High	Low N
30	Op	Waste	Local	Long	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
33	De	Waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N

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



F. Air pollution											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Highly probable	Low	Low	High	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
5	SE	Construction of access road	Local	Short	Direct	Negative	Definitely	Moderate	Medium	High	Low N
6	SE	Earthworks	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Low N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Low N
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Local	Short	Direct	Negative	Highly probable	Low	Medium	Low	Low N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Low N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	High	Low N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	High	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Low N
23	C	Liquid waste management	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N
24	Op	Generation of electricity - operation of PV plant	National	Long	Indirect	Positive	Definitely	Moderate			High P
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Permanent	Indirect	Positive	Definitely	Moderate			Low P
33	De	Waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Low	High	Low N

**Nature:** Noise and vibration due to machinery/processes/equipment/vehicles employed during construction/operational activities  
Dust/fumes generated/released during the earthworks/construction activities  
Smoke/gaseous emissions due to machinery/processes/equipment/vehicles employed during construction/operational activities  
Light emitted at night due to construction/operational activities

**G Land use potential (Grazing capacity and interaction with day to day farming activities)**

#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to			
								Reverse	Mitigate		
1	SE	Construction of electric fence to prevent access to site	Local	Long	Indirect	Negative	Definitely	Moderate	Low	Low	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
5	SE	Construction of access road	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Immediate	Short	Indirect	Negative	Definitely	Low	Medium	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Definitely	Low	Low	Medium	Low N
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
11	SE	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Definitely	Low	Medium	Medium	Medium N
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Low	Medium	Medium	Medium N
13	C	Handling and storage of soil and/or fill material	Local	Short	Indirect	Negative	Definitely	Moderate	Medium	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Indirect	Negative	Definitely	Moderate	Medium	Low	Low N
15	C	Construction of PV facility	Local	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Indirect	Negative	Definitely	Moderate	Medium	Medium	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Definitely	Moderate	Medium	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Indirect	Negative	Probable	Low	High	High	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Definitely	Low	Low	Medium	Low N
20	C	Transportation of bulk materials on-site			Indirect						
21	C	Handling, use and spillage of hazardous materials	Local	Short	Indirect	Negative	Definitely	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Negative	Definitely	Moderate	Medium	Medium	Low N
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Low	Medium	Medium	Low N
24	Op	Generation of electricity - operation of PV plant	Local	Long	Indirect	Negative	Definitely	Moderate	Low	Low	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Indirect	Positive	Definitely	Moderate			High P
29	Op	Handling and use of hazardous material	Local	Long	Indirect	Negative	Probable	Moderate	Low	Medium	Low N
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Indirect	Negative	Definitely	Moderate	Impossible	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Permanent	Indirect	Positive	Definitely	Moderate			High P
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Definitely	Low	Medium	Medium	Low N

**Nature:** Interference of construction and operational activities with the day-to-day management of the livestock and veld due to construction and other activities on the site

Loss of vegetation and grazing capacity

Denudation of the soil due to construction activities and loss of carrying capacity

H. Natural resource use											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to			
								Reverse	Mitigate		
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
9	SE	Transportation of bulk materials on-site	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Local	Medium	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal	Local	Short	Indirect	Positive	Highly probable	Low			Low P
23	C	Liquid waste management	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Medium	Low N
24	Op	Generation of electricity - operation of PV plant	National	Long	Indirect	Positive	Definitely	High			High P
25	Op	Maintenance of PV Modules	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
26	Op	Operation of on-site facilities for operational staff	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation	Local	Short	Indirect	Negative	Highly probable	Low	Impossible	Low	Low N
33	De	Waste management, storage and disposal									

Nature: Fuel usage (fossil fuel reserves)

		I. Species/habitat loss (Flora)										
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H		L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to				
								Reverse	Mitigate			
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Low	Low	Medium	Low N	
2	SE	Protection of natural features by creating no go areas	Local	Long	Direct	Positive	Highly probable	High			Medium P	
3	SE	Removal of pre-identified biota prior to earthworks										
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N	
5	SE	Construction of access road	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N	
6	SE	Earthworks	Local	Short	Direct	Negative	Highly probable	Low	Low	Low	Low N	
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N	
8	SE	Management of vehicles, machinery & equipment										
9	SE	Transportation of bulk materials on-site										
10	SE	Handling, use and spillage of hazardous materials										
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N	
12	SE	Liquid waste management										
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N	
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Long	Direct	Negative	Highly probable	Low	Medium	Low	Low N	
15	C	Construction of PV facility	Local	Short	Direct	Negative	Highly probable	Low	Low	Low	Low N	
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N	
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N	
18	C	Removal of all temporary construction structures & services after completion of construction										
19	C	Management of vehicles, machinery & equipment										
20	C	Transportation of bulk materials on-site										
21	C	Handling, use and spillage of hazardous materials										
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N	
23	C	Liquid waste management										
24	Op	Generation of electricity - operation of PV plant	Local	Long	Direct	Negative	Highly probable	Low	Low	Low	Low N	
25	Op	Maintenance of PV Modules										
26	Op	Operation of on-site facilities for operational staff										
27	Op	Maintenance of supporting infrastructure										
28	Op	Pest and invader plant control										
29	Op	Handling and use of hazardous material										
30	Op	Waste	Local	Long	Indirect	Negative	Highly probable	Low	Medium	Medium	Low N	
31	De	Removal of structures (buildings, PV panels, power lines etc.)										
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Highly probable	Low			Medium P	
33	De	Waste management, storage and disposal	Local	Short	Indirect	Negative	Highly probable	Low	Medium	Medium	Low N	

**Nature:** Loss of indigenous species as a result of the spreading of alien and invasive plants  
Vegetation clearance during site establishment and construction phases  
Loss of vegetation due to contamination of habitat

J. Species/habitat disturbance/loss (Fauna)											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Low	Low	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Permanent	Direct	Positive	Highly probable	Moderate			High P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
5	SE	Construction of access road	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
6	SE	Earthworks	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Low	Low N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Low	Medium	Low N
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Definitely	Moderate	Low	Low	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Highly probable	Low	Low	Medium	Low N
20	C	Transportation of bulk materials on-site	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Low	Low N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Direct	Negative	Definitely	Moderate	Low	Low	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material	Local	Long	Direct	Negative	Probable	Low	Low	Medium	Low N
30	Op	Waste	Local	Long	Indirect	Negative	Probable	Low	Medium	Medium	Low N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Highly probable	Moderate			High P
33	De	Waste management, storage and disposal									

**Nature:** Electrification of larger birds  
Collisions of larger birds, including vulnerable Blue Cranes and Busards, with powerlines  
Displacement of species due to habitat destruction  
Changes in invertebrate species and diversity as a result of changes in the temperature regime below panels

K. Habitat Transformation											
#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Definitely	Low	Medium	Medium	Low N
2	SE	Protection of natural features by creating no go areas	Local	Long	Direct	Positive	Definitely	Low			High P
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
5	SE	Construction of access road	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
6	SE	Earthworks	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Indirect	Negative	Definitely	Low	Medium	Medium	Low N
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
11	SE	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
12	SE	Liquid waste management	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Definitely	Low	Low	Low	Low N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Definitely	Low	Low	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Definitely	Low	Low	Medium	Low N
17	C	Construction of electrical connection line to the substation	Local	Short	Direct	Negative	Definitely	Low	Low	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Local	Short	Direct	Negative	Definitely	Low	Medium	Medium	Low N
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	Local	Long	Direct	Negative	Definitely	Low	Low	Low	Medium N
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Positive	Definitely	Low			High P
29	Op	Handling and use of hazardous material	Local	Long	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Definitely	Low			High P
33	De	Waste management, storage and disposal	Local	Permanent	Indirect	Negative	Highly probable	Low	Medium	Medium	Low N

**Nature:** Loss of plant species as a consequence of modification of vegetation and soils  
Loss of animal species due to transformation of habitat  
Loss of animal species due to deaths as a result of construction/operational activities

L. Heritage/Archaeological resources											
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Local	Short	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
6	SE	Earthworks	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Medium N
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility									
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal									

**Nature:** Destruction of archaeological artifacts and knapping sites  
Destruction of railway siding  
Destruction of dry packed walling  
Destruction of fossils during excavations

**M. Socio-Economic Impacts (land use, economic, conservation, hygiene, health and fire)**

#	Life-cycle	Activity	I/L/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to			
								Reverse	Mitigate		
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas	Local	Long	Direct	Positive	Definitely	Moderate			High P
3	SE	Removal of pre-identified biota prior to earthworks	Local	Long	Direct	Positive	Highly probable	Moderate			High P
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road	Regional	Short	Direct	Positive	Highly probable	Moderate			Low P
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Regional	Short	Indirect	Negative	Definitely	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Immediate	Short	Direct	Negative	Highly probable	Low	Low	High	Low N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
10	SE	Handling, use and spillage of hazardous materials	Immediate	Short	Direct	Negative	Highly probable	Moderate	Impossible	High	Low N
11	SE	Solid waste management, storage and disposal	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
12	SE	Liquid waste management	Immediate	Short	Direct	Negative	Definitely	Moderate	Low	High	Low N
13	C	Handling and storage of soil and/or fill material	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Medium N
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Regional	Short	Indirect	Negative	Probable	High	Low	High	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)									
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment	Immediate	Short	Direct	Negative	Highly probable	Low	Low	High	Low N
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
21	C	Handling, use and spillage of hazardous materials	Immediate	Short	Direct	Negative	Highly probable	Moderate	Impossible	Medium	Medium N
22	C	Solid waste management, storage and disposal	Regional	Short	Indirect	Negative	Definitely	Moderate	Impossible	Low	Medium N
23	C	Liquid waste management	Immediate	Short	Indirect	Negative	Definitely	Moderate	Low	High	Low N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control	Local	Long	Direct	Positive	Definitely	Moderate			High P
29	Op	Handling and use of hazardous material	Local	Long	Indirect	Negative	Highly probable	Moderate	Low	Medium	Medium N
30	Op	Waste	Regional	Long	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
32	De	Replanting of indigenous vegetation	Local	Permanent	Direct	Positive	Definitely	Moderate			High P
33	De	Waste management, storage and disposal	Local	Permanent	Indirect	Negative	Probable	Low	Low	Medium	Medium N

**Nature:**

Creation of temporary and permanent employment opportunities  
Benefit the local community indirectly through benefits associated with the provision of accommodation, catering and local spending by contractors  
Generation of renewable energy - benefit society in general  
Conservation of natural features by creating no-go areas and revegetating disturbed areas  
Potential hygiene impacts due to water contamination  
The construction and operation of the facility will affect the land-use of the area



N. Economic impact											
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	Potential to		Sign
			Extent	Duration	Status		Probability	Magnitude/ Intensity	Reverse	Mitigate	
1	SE	Construction of electric fence to prevent access to site	Regional	Short	Direct	Positive	Definitely	Moderate			Medium P
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities									
8	SE	Management of vehicles, machinery & equipment									
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure	Regional	Short	Direct	Positive	Definitely	Moderate			Medium P
15	C	Construction of PV facility	Regional	Short	Direct	Positive	Definitely	Moderate			High P
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Regional	Short	Direct	Positive	Definitely	Moderate			Medium P
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Positive	Definitely	Moderate			Medium P
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	National	Long	Direct	Positive	Definitely	High			High P
25	Op	Maintenance of PV Modules	Regional	Long	Direct	Positive	Highly probable	Moderate			Medium P
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure	Regional	Long	Direct	Positive	Highly probable	Moderate			Low P
28	Op	Pest and invader plant control	Regional	Long	Direct	Positive	Highly probable	Low			Low P
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Regional	Short	Direct	Positive	Highly probable	Low			Medium P
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal									

		O. Visual & Aesthetic Impacts (still to be assessed)									
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to			
								Reverse	Mitigate		
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Moderate	Medium	Medium	Low N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Medium	Medium	Low N
5	SE	Construction of access road	Local	Short	Direct	Negative	Probable	Moderate	Medium	High	Low N
6	SE	Earthworks	Local	Short	Direct	Negative	Probable	Moderate	Medium	Medium	Low N
7	SE	Provision and operation of on site staff facilities and activities	Local	Short	Direct	Negative	Highly probable	Moderate	Medium	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
11	SE	Solid waste management, storage and disposal	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
12	SE	Liquid waste management	Immediate	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
13	C	Handling and storage of soil and/or fill material	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
14	C	Establishment of stormwater drainage and other services infrastructure	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
15	C	Construction of PV facility	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
17	C	Construction of electrical connection line to the substation									
18	C	Removal of all temporary construction structures & services after completion of construction	Local	Short	Direct	Negative	Probable	Low	Low	Medium	Low N
19	C	Management of vehicles, machinery & equipment	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
21	C	Handling, use and spillage of hazardous materials	Local	Short	Direct	Negative	Probable	Low	Medium	Medium	Low N
22	C	Solid waste management, storage and disposal	Regional	Short	Direct	Negative	Definitely	Moderate	Medium	Medium	Low N
23	C	Liquid waste management	Immediate	Short	Direct	Negative	Highly probable	Low	Medium	Medium	Low N
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)									
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal	Regional	Permanent	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N

**Nature:**

Visual contrast caused by clearance of vegetation  
 Visual disturbance caused by construction activities  
 Visual disturbance caused by large number of solar panels  
 Visual intrusion of ancillary buildings and structures on views of highly sensitive visual receptors  
 Visual intrusion caused by additional powerlines in the viewshed  
  
 Glint and glare from solar arrays and other features, including buildings windows and roofs, cause visual intrusion on views of sensitive visual receptors

**P. Infrastructural Impacts (sewage, electricity and water supply)**

#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to			
								Reverse	Mitigate		
1	SE	Construction of electric fence to prevent access to site	Local	Long	Direct	Negative	Highly probable	Moderate	Low	Low	Medium N
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material									
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Medium N
8	SE	Management of vehicles, machinery & equipment	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Medium	Low N
9	SE	Transportation of bulk materials on-site									
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Medium N
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Medium N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Low N
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Negative	Definitely	Moderate	Impossible	Low	Low N
18	C	Removal of all temporary construction structures & services after completion of construction									
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site									
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant	National	Long	Direct	Positive	Definitely	High			High P
25	Op	Maintenance of PV Modules	Local	Long	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
26	Op	Operation of on-site facilities for operational staff	Regional	Long	Direct	Negative	Definitely	Low	Low	Medium	Medium N
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Regional	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Medium N
32	De	Replanting of indigenous vegetation	Local	Short	Direct	Negative	Highly probable	Moderate	Low	Low	Medium N
33	De	Waste management, storage and disposal									

**Nature:** Pressure on regional water and electricity supply  
Pressure on local sanitation

		Q. Traffic Impacts									
#	Life-cycle	Activity	L/I/R/N	S/M/L/P	D/I	+/-	I/P/HP/D	L/M/H	I/L/M/H	L/M/H	Sign
			Extent	Duration	Status	Probability	Magnitude/ Intensity	Potential to			
								Reverse	Mitigate		
1	SE	Construction of electric fence to prevent access to site									
2	SE	Protection of natural features by creating no go areas									
3	SE	Removal of pre-identified biota prior to earthworks									
4	SE	Handling and storage of soil and/or fill material	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
5	SE	Construction of access road									
6	SE	Earthworks									
7	SE	Provision and operation of on site staff facilities and activities	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
8	SE	Management of vehicles, machinery & equipment	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
9	SE	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
10	SE	Handling, use and spillage of hazardous materials									
11	SE	Solid waste management, storage and disposal									
12	SE	Liquid waste management									
13	C	Handling and storage of soil and/or fill material									
14	C	Establishment of stormwater drainage and other services infrastructure									
15	C	Construction of PV facility	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
16	C	Construction of electrical infrastructure (inverters, concentration boxes, transformation centre, electrical reticulation, underground cabling and distribution boxes)	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
17	C	Construction of electrical connection line to the substation	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
18	C	Removal of all temporary construction structures & services after completion of construction	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
19	C	Management of vehicles, machinery & equipment									
20	C	Transportation of bulk materials on-site	Regional	Short	Direct	Negative	Highly probable	Moderate	Low	Medium	Low N
21	C	Handling, use and spillage of hazardous materials									
22	C	Solid waste management, storage and disposal									
23	C	Liquid waste management									
24	Op	Generation of electricity - operation of PV plant									
25	Op	Maintenance of PV Modules									
26	Op	Operation of on-site facilities for operational staff									
27	Op	Maintenance of supporting infrastructure									
28	Op	Pest and invader plant control									
29	Op	Handling and use of hazardous material									
30	Op	Waste									
31	De	Removal of structures (buildings, PV panels, power lines etc.)	Regional	Short	Direct	Negative	Definitely	Moderate	Low	Medium	Low N
32	De	Replanting of indigenous vegetation									
33	De	Waste management, storage and disposal									

**Nature:** Deterioration of road infrastructure during construction activities  
 Disruption of traffic due to construction activities  
 Increased traffic volumes and related negative impacts, i.e. congestion, noise, accidents etc.  
 Negative impact of increased traffic volumes on surrounding farming communities