Draft Scoping Report

Proposed 90 MW Drennan Photovoltaic (PV) Power Facility, Eastern Cape

Solaire Direct Southern Africa (Pty) Ltd

DEA Ref: 14/12/16/3/3/2/359

November 2012

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ERM Reference: 0166587

Prepared by: Dean Alborough

For and on behalf of
Environmental Resources Management

Approved by: Brett Lawson

Signed:

Position: Partner

Date: 19 November 2012

TABLE OF CONTENTS

ACRONYMS

ABBREVIATIONS

DEFINITIONS AND TERMINOLOGY

ACRONYMS

BID	Background Information Document
DEA	Department of Environmental Affairs
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ERM	Environmental Resources Management
GN	Government Notice
I&APs	Interested & Affected Parties
IPP	Independent Power Producer
NEMA	National Environmental Management Act
NERSA	National Energy Regulator of South Africa
SAHRA	South African Heritage Resources Agency
SIBIS	South African National Biodiversity Institute Integrated Biodiversity Information System
ToR	Terms of Reference

ABBREVIATIONS

%	Percent
cm	Centimetres
CO_2	Carbon Dioxide
GWh	Giga Watt Hour
kg	Kilograms
km	Kilometres
km^2	Square kilometres
kV	Kilovolt
m	Metres
MW	Mega Watts
mS/m	MilliSiemens per metre
m^2	Square meters
R	South African Rand

DEFINITIONS AND TERMINOLOGY

Alternative: A possible course of action, in place of another, that would meet the same purpose and need (of the proposal). Alternatives can refer to any of the following but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.

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

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

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

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

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. This includes the economic, social, cultural, historical and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

Environmental Assessment: The generic term for all forms of environmental assessment for projects, plans, programmes or policies. This includes methods/tools such as environmental impact assessment, strategic environmental assessment, sustainability assessment and risk assessment.

Impact: The positive or negative effects on human well-being and / or on the environment.

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

Environmental Management Programme: An operational plan that organises and coordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

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

Interested and Affected Parties (I&APs): Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by the proposal or activity and/or who are concerned with a proposal or activity and its consequences.

Competent Authority: The environmental authority at the national or provincial level entrusted in terms of legislation, with the responsibility for granting or refusing environmental authorisation in respect of an activity.

Mitigate: The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

Scoping: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).

Stakeholder engagement: The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.

1. INTRODUCTION

1.1 PURPOSE OF THIS REPORT

Solaire Direct Southern Africa (Solaire Direct) has appointed Environmental Resources Management Southern Africa (Pty) Ltd (ERM), as independent environmental consultants to undertake the Environmental Impact Assessment (EIA) process for the proposed new photovoltaic (PV) power facility located approximately 36 km southeast of Cradock in the Eastern Cape. It is intended that the electricity generated by the PV power facility will feed into the national power grid through Eskom's Drennan Traction Line Substation, through an approximately 250 m long overhead powerline.

This Draft Scoping Report has been compiled as part of the EIA process in accordance with the regulatory requirements stipulated in the EIA Regulations (Government Notice R543) promulgated in terms of Section 24(5) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended. The objectives of this report are to provide information to Interested and Affected Parties (I&APs), including the public and authorities, on the EIA process followed to date and the proposed project.

The Scoping Report provides a description of the proposed project activities, alternatives considered, the EIA methodology, and issues and concerns identified by the project team and/or raised by I&APs. A Plan of Study for the EIA, which includes the terms of reference for specialist studies, is also included.

1.2 PROJECT OVERVIEW

Solaire Direct is planning a new PV power facility for the generation of solar energy in the Inxuba Yethemba Local Municipality, Eastern Cape (see *Figure 5.6*). The proposed site is located on the remaining extent of Farm Drennan (refer to *Figure 4.1*), specifically:

- Portion 39 of farm 523;
- Portion 0 of farm 600; and
- Portions 15 and 16 of Portion 1 of the Farm Waai Plaats (no. 550), Cradock.

The proposed development includes the installation and operation of solar PV panels (connected to each other in PV arrays) with a projected output of up to 90 megawatts (MW). It is intended that the electricity generated by the proposed facility will feed into the national power grid network via the existing 132 kV Drennan Traction Substation on site.

The proposed PV power facility will consist of the following:

- PV panels/modules (arranged in arrays);

- PV module mountings;
- DC-AC current inverters;
- New grid connection substation;
- Underground cabling/ overhead power lines;
- On-site buildings (including an operational control centre, office, ablutions and a guard house);
- Access roads and internal road network; and
- Ancillary infrastructure

In addition, associated infrastructure will be required such as a temporary construction camp and meteorological building.

1.3 PROJECT PROPONENT

Solaire Direct Southern Africa (Pty) Ltd is a subsidiary of the Solaire Direct Group, the largest privately owned solar power producer in France. Solaire Direct Southern Africa operates as an independent power producer (IPP) in Southern African Development Community (SADC) countries.

Founded in France in 2006, the Solaire Direct Group has successfully developed, financed and completed 14 solar projects with a total installed capacity of 120 MW. The Solaire Direct Group has power generation subsidiaries around the globe, including Southern Africa, Northern Africa, India and South America. Furthermore, Solaire Direct has a PV module manufacturing subsidiary, Solaire Direct Technologies, located in South Africa.

1.4 DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

1.4.1 ERM Southern Africa

ERM was appointed by Solaire Direct to undertake the EIA for the proposed Drennen 90 MW PV power facility. ERM and specialists appointed by ERM during the course of this EIA have no financial ties to, nor are they a subsidiary, legally or financially, of Solaire Direct. Remuneration for the services by the Applicant (Solaire Direct) in relation to this EIA is not linked to approval by any decision-making authority and ERM has no secondary or downstream interest in the development.

ERM is a global environmental consulting organisation employing over 3,500 specialists in over 145 offices in more than 41 countries. Founded in 1971, ERM has built an organisation based on the supply of a full range of environmental and social policy, scientific, technical, and regulatory expertise. ERM's primary focus is to provide quality work and service to our clients in these areas.

From a regional perspective ERM has been involved in numerous projects in Africa over the past 30 years and in 2003 established a permanent presence in Southern Africa to meet the growing needs of our clients. The Southern African ERM offices are based in Cape Town, Johannesburg, Pretoria and Durban. ERM Southern Africa has a staff complement of over 120 dedicated environmental professionals offering expert skills in EIA, EMP, EMS, risk assessment, EHS management and auditing, corporate social responsibility and socio-economic impact assessment, climate change services, specialist groundwater services as well as contaminated site management. ERM Southern Africa has recently undertaken a number of EIAs for PV power facilities, including in the Northern Cape, Western Cape and the Free State.

1.4.2 Project Team

The project team includes ERM consultants, support staff and external specialists. Details of the external specialists that form part of the team are provided in *Section 7.3*. Details of ERM's core project team are provided below.

Table 1.1 ERM Core Project Team

Partner in Charge	**Brett Lawson** MA Environ & Geog Sciences, University of Cape Town. Registered EAPSA Practitioner and SACNASP member.
Principal Project Manager	**Tania Swanepoel** BSc Hons (Engineering & Environmental Geology) University of Pretoria, BSc Hons (Geology and Geohydrology), University of the Western Cape, IAIA, Pr Sci Nat.
Project Manager	**Dean Alborough** Bsc Hons (Integrated Environmental Management) & MSc (Environmental Science and Biotechnology), University of Cape Town.

The Partner in Charge, Brett Lawson, has considerable multi-disciplinary experience across the range of developmental and environmental sciences in a variety of geographies, including particular expertise in the environmental implications of energy generation and transmission. A summary of power-related EIAs, EMPs and environmental reviews undertaken by Brett to date comprise eight coal-fired power stations, five wind energy facilities, three solar (PV) facilities, a hydro plant, two gas turbine facilities, 19 distribution and

transmission lines, two substations and the environmental auditing of two coal-fired power stations, four transmission substations and two transmission lines.

The Principal Project Manager, Tania Swanepoel, has over thirteen years of broad-based environmental and consulting experience in South Africa and has worked on a variety of EIA projects including renewable energy facilities, infrastructure developments and oil and gas projects.

The Project Manager, Dean Alborough, has more than 4 years of relevant experience in Integrated Environmental Management, and more than 6 years in environmental science. Dean has been involved in a number of EIAs in the renewables (wind and solar) and in the oil and gas sector. Of relevance, Dean has recently completed two South African solar PV EIAs, and has acted as a consultant to other solar PV EIAs undertaken within ERM. Dean is also involved in ERM's global solar PV network, and has undertaken reviews of international practice regarding solar park environmental assessments. Dean is knowledgeable on South African environmental legislative requirements as well as international best practice guidelines, including the IFC Performance Standards.

1.5 OPPORTUNITY TO COMMENT ON THE SCOPING REPORT

Interested and Affected Parties (I&APs) and authorities are being provided with an opportunity to comment on any aspect of the proposed activity and this Draft Scoping Report. The Draft Scoping Report has been made available at the Cradock Public Library. It can also be viewed on the project website at:

http://www.erm.com/solairedirect-drennan

A notification letter has been sent to registered and identified I&APs to inform them of the release of the Draft Scoping Report and where the report can be reviewed.

Comments can be provided to ERM at the address, tel /fax numbers or e-mail address shown below. The public comment period is from 22 November – 20 January 2012. All stakeholder comments and concerns will be captured in the Final Scoping Report.

Attention: Tougheeda Aspeling
Solaire Direct Drennan PV Power Facility
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1.6 STRUCTURE OF THIS REPORT

The remainder of this Draft Scoping Report is structured as follows:

Table 1.2 Draft Scoping Report Structure

Section	Contents
Section 2 Applicable Legislation and Planning Policy	Overview of applicable legislation and policy.
Section 3 EIA Process	Outlines the approach to the EIA study and summarises the process undertaken for the project to date.
Section 4 Project Description and Consideration of Alternatives	Includes the project justification, a detailed description of the proposed activities and the consideration of alternatives.
Section 5 Environmental and Socio-economic Baseline	Describes the receiving environment, including biophysical and socio-economic aspects.
Section 6 Preliminary Identification of Issues Impacts	Provides a summary of key issues raised and the potential impacts associated with the proposed development.
Section 7 Plan of Study for EIA	Provides concluding comments about the proposed activity and outlines the terms of reference for specialist studies to address identified key issues.
Section 8 Next Steps	Describes the next steps in the EIA process.
Section 9 References	Provides all references used in the Draft Scoping Report.

In addition, the report includes the following annexes:

- *Annex A:* Legislative Framework
- *Annex B:* Site Photolog
- *Annex C:* Public Participation Documentation
- *Annex D:* Comments and Responses Report (to be included in the Final Scoping Report)
- *Annex E:* Communication with DEA
- *Annex F:* Project Infrastructure Specifications
- *Annex G:* Maps

2 APPLICABLE LEGISLATION AND PLANNING POLICY

2.1 APPLICABLE LEGISLATION

The proposed activity is subject to legislative and policy requirements at a national and provincial level. A detailed description of relevant legislation pertaining to the EIA process for the proposed PV power facility project and the permitting thereof, is contained in *Annex A*. This legislation includes the following:

- National Environmental Management Act (Act No. 107 of 1998), as amended and associated EIA Regulations (GN R543, R544, R545 and R546 of June 2010);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- National Water Act (Act No. 36 of 1998);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- National Forests Act (Act No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999);
- Electricity Regulation Act (Act No. 4 of 2006);
- Occupational Health and Safety Act (Act No. 85 of 1993);
- Hazardous Substances Act (Act No. 15 of 1973);
- Conservation of Agricultural Resources Act (Act No. 43 of 1983);
- Subdivision of Agricultural Land Act (Act No. 70 of 1970);
- Eastern Cape Parks and Tourism Agency Bill (2010); and
- Nature and Environmental Conservation Ordinance (19 of 1974).

The relevant legislation pertaining to the Environmental Authorisation for the proposed development is the National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment (EIA) Regulations of 2010 promulgated under NEMA. The relevance of this legislation is summarised below.

2.1.1 National Environmental Management Act (NEMA)

NEMA requires that activities be investigated that may have a potential impact on the environment, socio-economic conditions, and cultural heritage. The results of such investigation must be reported to the relevant authority. Procedures for the investigation and communication of the potential impact of activities are contained in Section 24 (7) of the Act.

Section 24(C) of the Act defines the competent decision-making authority which in this case is the national environmental department, the Department of Environmental Affairs (DEA).

2.1.2 EIA Regulations

The EIA Regulations of June 2010 (Government Notice R544, R545 and R546) identify activities which may have a detrimental effect on the environment and the listed activities which may be triggered by the proposed PV power facility. These include:

GN 544:

Activity 10 (i): *'The construction of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts…'*

Activity 11 (xi): *'The construction of infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.'*

Activity 13: *'The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 m^3 but not exceeding 500 m^3.'*

Activity 22 (ii): '*The construction of a road outside urban areas where no reserve exists where the road is wider than 8 metres..*

Activity 27 (i) & (ii): *'The decommissioning of existing facilities or infrastructure, for (i) electricity generation with the threshold of more than 10MW and (ii) electricity transmission and distribution with a threshold of more than 132kV.'*

GN 545:

Activity 1: *The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.*

Activity 8: *'The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex'.*

Activity 15: *'Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply'.*

GN 546:

Activity 14: *'The clearing of an area of 5 hectares or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation.'*

Government Notice R543 sets out the procedures and documentation for Scoping and EIA that need to be complied with.

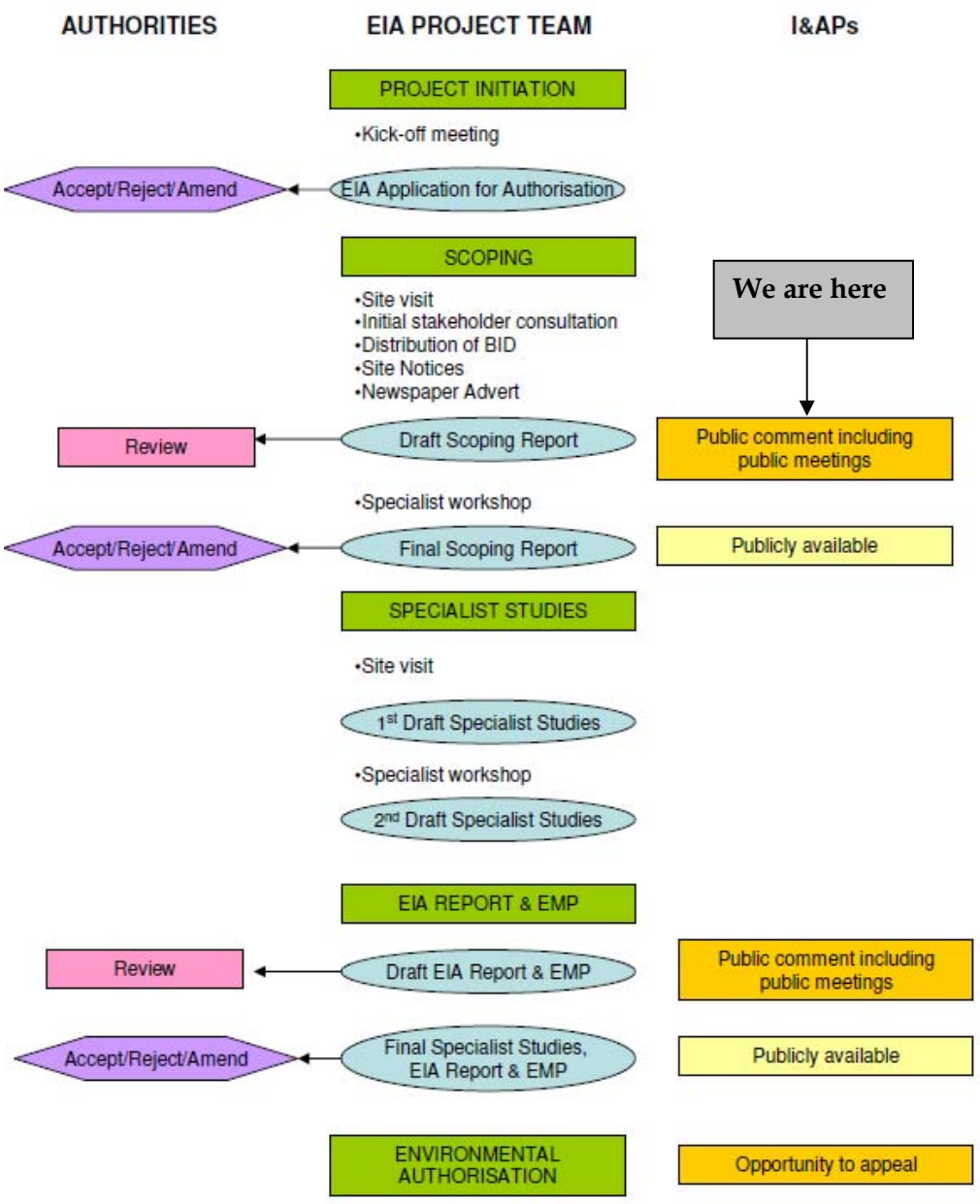
2.2 *REGIONAL PLANNING CONTEXT*

Certain activities related to the proposed development may, in addition to national legislation, be subject to control by municipal by-laws for aspects such as planning, dust, noise and roads, as well as any Chris Hani District Municipality Integrated Development Plans (IDPs). Relevant legislation, policies and plans will be identified as part of the various specialist studies during the EIA Phase.

The EIA process is illustrated in *Figure 3.1* and consists of the following three phases:

- Scoping Phase;
- Specialist Study Phase; and
- Integration and Assessment Phase.

Figure 3.1 EIA Process Flow Diagram



3.1 SCOPING PHASE

The first phase of the EIA process is a Scoping Study, with an emphasis on public involvement. This project is currently in this phase of the EIA process. The various tasks and consultation activities undertaken thus far by ERM are described and summarised below.

3.1.1 Initial Site Visit and Project Initiation

As part of the project initiation, ERM carried out an initial site reconnaissance visit on the 1 March 2012. The purpose of the site visit was to familiarise the project team with the project proposal and Study Area and to begin the environmental and social screening and scoping process. Two site notices were erected during the site visit (see *Section 3.1.2* below).

3.1.2 Public Participation

Table 3.1 details the public participation tasks that have been undertaken as part of the Scoping Study.

Table 3.1 Public Participation Tasks: Scoping Phase

Activity	Description and Purpose
Preparation of a preliminary stakeholder database	A preliminary database has been compiled of authorities (local and provincial), Non-Governmental Organisations and other key stakeholders (refer to *Annex C*). This database of registered I&APs will be expanded during the ongoing EIA process.
Erection of site notices	Site notices were placed at the N10/R310 intersection (the entrance to the site). See *Annex C*.
Distribution of BIDs	Background Information Documents (BIDs) were distributed to all I&APs.

3.1.3 Authority Consultation

Authority consultation and involvement up until the release of the Draft Scoping Report included:

- Submission of an EIA Application for Authorisation form to DEA on 6 June 2012. DEA's Acknowledgement of Receipt and approval to proceed with the Scoping Study was received on 20 June 2012, DEA Reference 14/12/16/3/3/2/359, and is attached in *Annex E*.

3.2 SPECIALIST STUDIES PHASE

A number of specialist studies have been identified to address key issues of concern. The findings of these studies will be incorporated into the Environmental Impact Report (EIR) that will round out the Integration and Assessment Phase. Further information related to the approach to the

specialist studies and the impact assessment is contained in the Plan of Study for EIA in *Section 7.*

3.3 INTEGRATION AND ASSESSMENT PHASE

The final phase of the EIA is the Integration and Assessment Phase, which is described in detail in the Plan of Study for EIA (*Section 7)*. The assessment of impacts proceeds through an iterative process considering three key elements:

a) **Prediction of the significance** of impacts that are the consequence of the proposed development on the natural and social environment.

b) **Development of mitigation measures** to avoid, reduce or manage the impacts.

c) **Assessment of residual significant impacts** after the application of mitigation measures.

A synthesis of the specialist studies, which addresses the key issues identified during the Scoping Phase, will be documented in a Draft EIR. Relevant technical and specialist studies will be included as appendices to the Draft EIR. The Draft EIR will be made available to I&APs for a public comment period and registered and identified I&APs will be notified of the release of the Draft EIR and where the report can be reviewed.

Comments received on the Draft EIR will be assimilated and the EIA project team will provide appropriate responses to all comments. A Comments and Responses Report will be appended to the Final EIR, which will be submitted to DEA for decision-making.

All registered I&APs will be notified when an Environmental Authorisation has been issued by DEA. A 40-day appeal period will follow the issuing of the Environmental Authorisation.

3.3.1 Proposed Timeframe for the EIA

The estimated process schedule for the EIA is presented in *Table 3.2*. *Section 7* of this report presents a more detailed Plan of Study for the EIA.

Table 3.2 Estimated EIA Schedule

Task	Date
Stakeholder Comment on Draft Scoping Report and Plan of Study for EIA	22 November – 20 January 2012
Finalise Scoping Report and Plan of Study for EIA and submit to DEA	End January 2012
Acceptance of Scoping Report received from DEA	Mid March 2012
Specialist studies	Mid March – April 2013
Prepare Draft EIR and EMP	April – May 2013
Stakeholder Comment on Draft EIR and EMP	May– June 2013
Finalise and submit EIR and EMP to DEA	July 2013

4 PROJECT DESCRIPTION AND CONSIDERATION OF ALTERNATIVES

This Chapter provides an overview of the proposed Solaire Direct Drennan PV Power Facility. Project activities and requirements for the construction, operation and decommissioning of the facility are discussed in this section, as well as the motivation for the project and the alternatives considered.

4.1 MOTIVATION

Global dependence on fossil fuels, rising fossil fuel prices and concern regarding the impacts of climate change has resulted in increasing international pressure on countries around the world to increase their share of energy derived from renewable sources. Targets for the promotion of renewable energy now exist in more than 58 countries around the world and solar energy is emerging as an important component of the energy market in a number of countries.

The South African government has developed a policy framework (the White Paper on Renewable Energy) and set a target of sourcing 10,000 GWh from renewable energy projects by 2013. This amounts to approximately 4 percent of South Africa's total estimated energy demand by 2013. At the Copenhagen Conference in December 2009, South Africa's president also set a target for the reduction of CO_2 emissions, as laid out in the Integrated Resource Plan (IRP 2010), which sets a target reduction of CO_2 emissions by 34 percent by 2020. The utilisation of renewable energy will play a major role in achieving this goal. South Africa's commitment to achieving this goal was reiterated by Minister Edna Molewa at the December 2010 Climate Change Conference in Cancun, Mexico. At present, approximately 77 percent of the power consumed in South Africa is generated from coal and as a country South Africa is among the largest emitters of CO_2 globally.

In addition, PV power facilities are more effective where there is a high level of solar radiation. South Africa and more specifically the Eastern Cape Province experience some of the highest levels of solar radiation in the world. As such, the development of renewable energy projects such as this presents an opportunity for contributing to sustainable development and growth of the province and the country at large.

The intentions of Solaire Direct in establishing a PV power facility include reducing South Africa's dependence on non-renewable fossil fuel resources, contributing towards the reduced emissions targets and goals the South African government has set out, and contribute to climate change mitigation.

The Renewable Energy Independent Power Producer Procurement Programme (IPP Procurement Programme) has been designed for the following reasons:

- To allow the private sector to contribute to the generation of renewable energy (and the target set by government);

- To contribute towards socio-economic and environmentally sustainable growth; and

- To enhance the renewable energy sector in South Africa.

Applicants are allowed to submit a proposal for the finance, construction, operation and maintenance of renewable energy facilities.

In terms of future National energy trends, South Africa's policy-adjusted IRP (Department of Energy, 2011) estimates that additional energy capacity by 2030 will include 17.8 GW from renewable sources, with solar PV and wind energy receiving an equal share of the overall energy allocation from renewable sources, with a small portion (1 GW), allocated to concentrated solar power. The IRP stipulates that by 2030 energy from renewable sources will constitute 9% of South Africa's overall energy budget. Against this background, the cumulative impact of this 90 MW development as well as the numerous other proposed solar power facilities in the area may prove significant.

Beyond the positive climate impact however, solar energy is very well placed to rapidly come on line and contribute to alleviating the power gap in South Africa. Emergency load shedding in South Africa during 2007 and 2008 highlighted the challenges facing the country in terms of electricity generation, transmission and distribution. The National Energy Response Plan (NERP), drafted at the time, acknowledged the role that independent power producers (IPPs) (including those harnessing renewable energy resources) can play in ensuring sustainable electricity generation, and sets a goal that 30 percent of all new power generation will be derived from IPPs .

The development of solar energy in the Eastern Cape offers the opportunity for a new industry in the province. Existing levels of employment are low within the province and wider site locality. Employment is considered to be the single biggest opportunity outside of the advantages expressed above, associated with the project. Training provided to employees will provide individuals with a skill set that will be highly desirable throughout the industry sector in South Africa, as the renewable energy industry and specifically, the solar energy sector rapidly develops, increasing potential opportunities available to such individuals.

4.2 PROJECT LOCATION AND EXISTING LAND USE

The site for the proposed PV power facility is located in Inxuba Yethemba Local Municipality, Eastern Cape, on the remaining extent of Farm Drennan

(see *Figure 4.1*). Areas being considered for development of the proposed facility and associated infrastructure include the following farm portions:

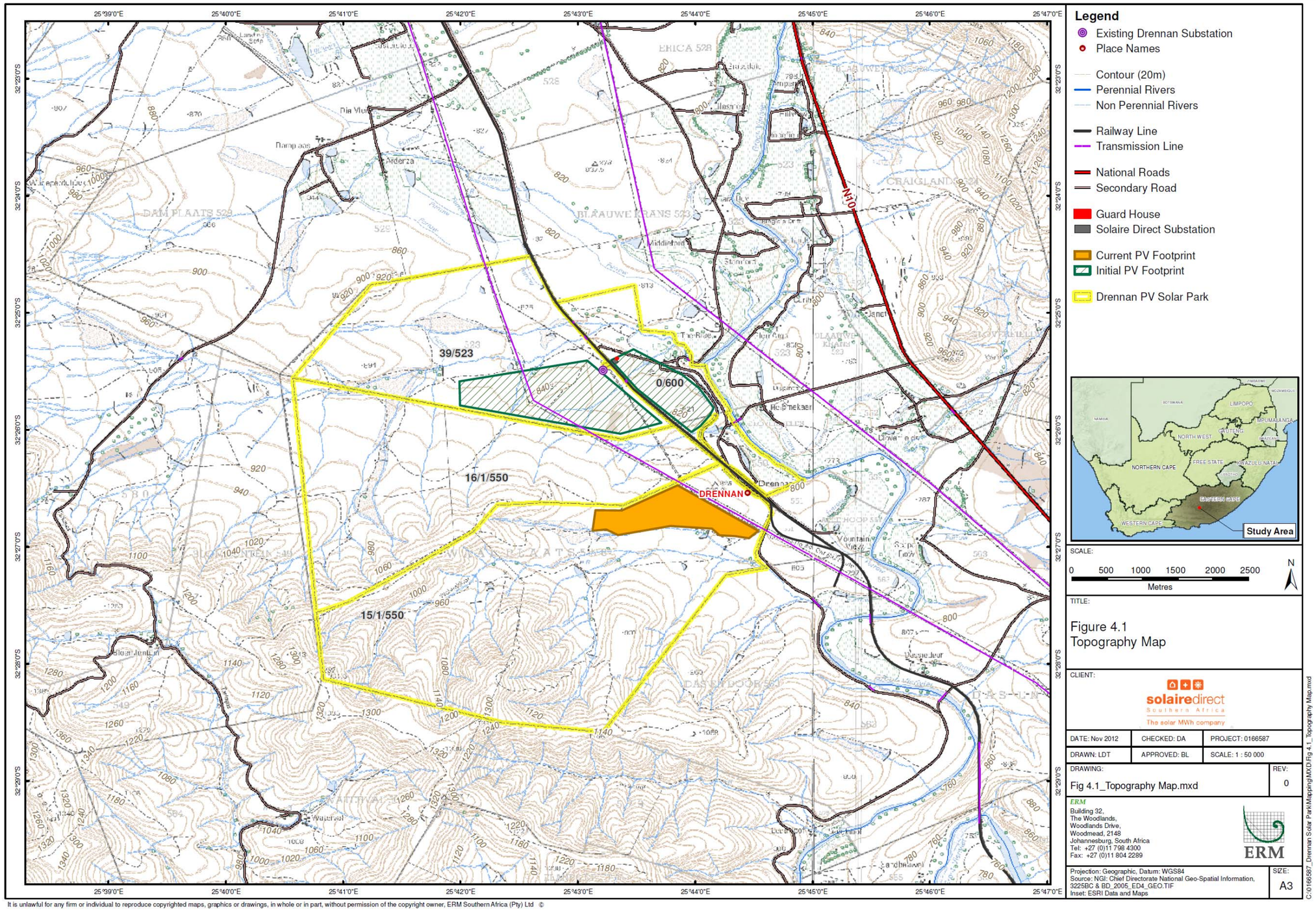
- Portion 39 of Farm 523;
- Portion 0 of Farm 600; and
- Portions 15 and 16 of Portion 1 of the Farm Waai Plaats (no. 550), Cradock.

The site is located 28 km South of Cradock, approximately 5.5 km west off the N10 and is accessible via the R390 (gravel road).

The site is designated for agricultural use, with current agricultural practices including grazing for livestock (cattle, sheep). Limited cultivation is undertaken within the proposed Project site, with a single crop circle typical of pivot agriculture located around 60 m to the north of the site earmarked for development. Land use in the surrounding area includes further sheep and cattle farming. Substantial cultivation is conducted on the east banks of the Great-Fish River which is located less than 1 km to the east of the Project site. Drainage lines occur throughout the Project site. These include two significant lines that run in a westerly to easterly direction, one directly to the south of the site, and another which cuts across the northern parcel of land designated for Project development. There are two small dams that are located at points along the drainage lines within Project area, the nearest of which is located 200 m to the south of the site.

There is an existing railway line traversing the site in a north south direction. An existing gravel road network exists on the site, which crosses the railway line. The existing 132kV Drennan Traction Substation is located within the northern section of the site, and an existing 132 kV power line traverses the northeastern section of the site from the Drennan Traction Substation in a northwest/southeast direction, exiting the northern boundary of the site.

Figure 4.1 *Location of Drennan PV Power Facility on the Topographical Map*



4.3 *PV PLANTS AND POWER GENERATION*

Solar energy systems produce energy by converting solar irradiation into electricity or heat. For the proposed PV power facility, Solaire Direct will utilise photovoltaic (PV) technology to generate electricity. PV technology consists of the following components:

- **PV cell;** a basic photovoltaic device, which generates electricity when exposed to solar radiation. The absorbed solar energy excites electrons inside the cells and produces electrical energy. The PV cells are commonly constructed from polycrystalline silicon. All photovoltaic cells produce direct current (DC).

- **PV module or panel;** the smallest complete assembly of interconnected photovoltaic cells. In the case of crystalline silicon cells, following testing and sorting to match the current and voltage, the cells are interconnected and encapsulated between a transparent front (usually glass) and a backing material. The module is then typically mounted in an aluminium frame.

- **PV array;** a mechanically integrated assembly of modules and panels together with support structures, to form a direct current power producing unit. The proposed PV power facility will consist of antireflective modules arranged in numerous arrays. The feeding of electricity into the grid requires the transformation of DC from the PV array into alternating current (AC) by means of an inverter.

4.4 *PROJECT COMPONENTS*

It is anticipated that the project will feed a total of 90 MW into the national grid. The key components of the proposed PV power plant are discussed in detail below:

- PV solar panels/modules (arranged in arrays);

- PV module mountings;

- DC-AC current inverters and transformers;

- New grid connection substation;

- Underground cabling/ overhead power lines;

- On-site buildings (including an operational control centre, office, ablutions and a guard house);

- Access roads and internal road network; and

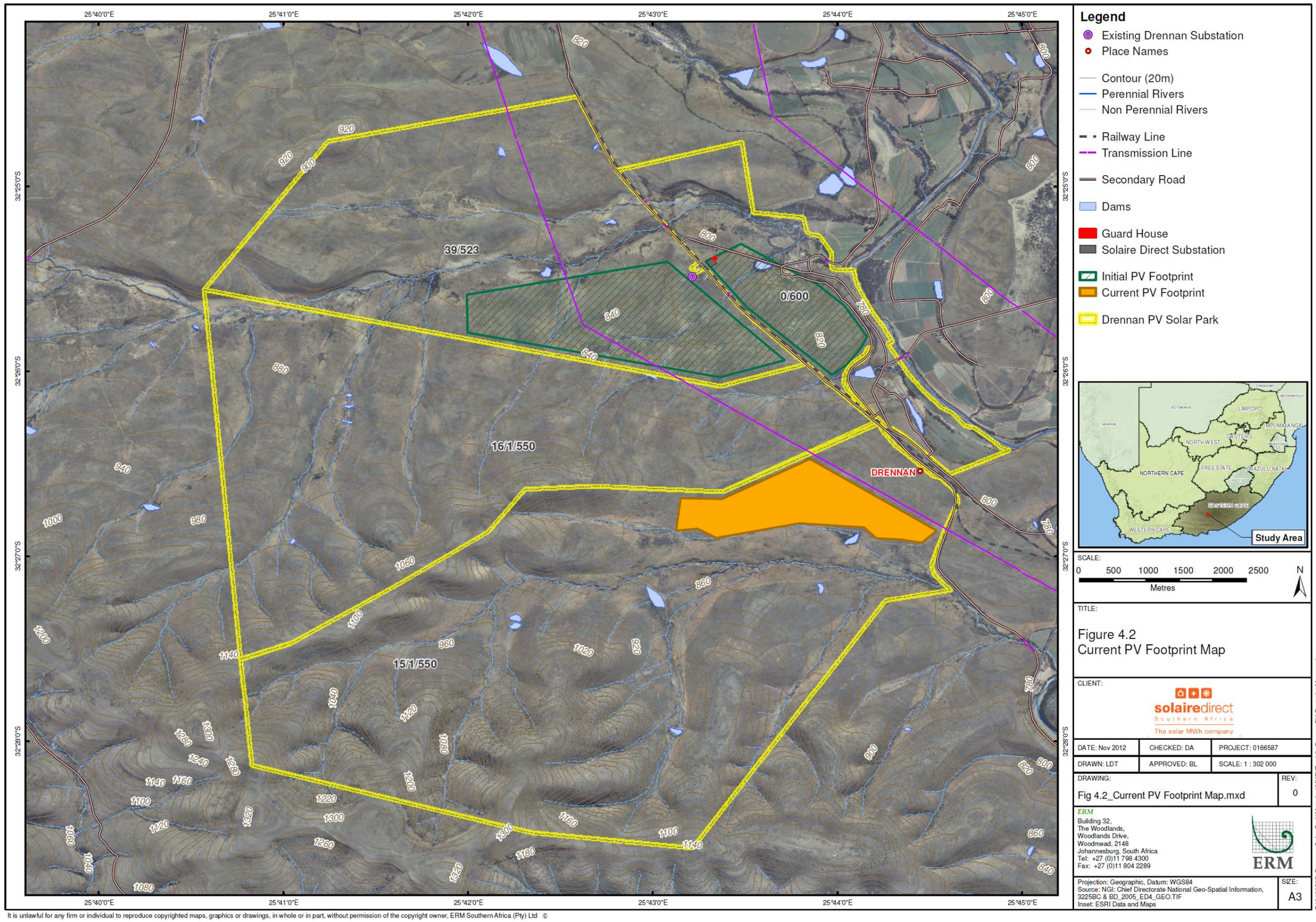
- Ancillary infrastructure.

A preliminary survey to assess the feasibility of various development footprint options was undertaken during the scoping phase. As part of this survey, two separate development footprint options were identified, including:

- The 'initial PV footprint' - an area of 150 ha located adjacent to the eastern and western sides of the Transnet railway line on Portion 39 of Farm 523 and Portion 0 of Farm 600 respectively (refer to *Figure 4.2*).
- The 'current PV footprint' – an area of approximately 110 ha located directly adjacent to the western side of the existing powerlines on Portions 15 and 16 of Portion 1 of Farm Waai Plaats (no. 550) (refer to *Figure 4.2*).

The above mentioned 'initial PV footprint' is considered inappropriate for the proposed development for agricultural reasons (the landowner has earmarked this site for future cultivation). As such, no further assessment of this initial PV footprint location is considered necessary. In contrast, the 'current PV footprint' is considered a feasible option for a development of this nature and hence will be assessed further during the subsequent phases of the EIA process. In this regard, it is important to note that the PV footprint selection process is based on various environmental and technical constraints and is subject to change throughout the EIA process. Refer to *Section 4.10.1* below for further detail on the manner in which potential development footprint sites are chosen.

Figure 4.2 *Current PV Footprint Map*



4.4.1 PV Arrays and Mountings

With respect to the 'current PV footprint' option (refer to *Section 4.4* above), the proposed development will include PV panels that will occupy approximately 110 ha (1.1 km^2) of the site area in total. The PV panels will be 1660 mm in length, 990 mm in width and 45 mm in height with each producing an output of 300 W. Each PV panel will weigh approximately 19 kg. Within each PV panel there will be 60 polycrystalline cells (each 156 mm x 156 mm). These polycrystalline cells will be encapsulated in Ethylene Vinyle Acetate (EVA). The front substrate of the PV panel will be 3.2 mm of antireflection glass, while the back substrate will be Tedlar or APA composite sheeting. Each PV panel will be placed in a black or raw anodized aluminium frame 45 mm in width and equipped with drainage holes. PV panels will be connected in arrays to form units with a total power of 1MW each (around 249500 PV panels will be installed on a 90 MW project). See *Annex F* for further technical specifications of the PV panels.

The PV panels will be mounted on aluminium fixed frame structures approximately 3.33 m in height from the ground (see *Figure 4.3*). The aluminium structures will be mounted on steel screw piles or concrete foundations 1500 mm deep, depending on soil conditions. The distance or spacing between rows will be approximately 6.2 m. The PV arrays will face north in order to capture maximum sunlight. *Figure 4.4* shows a typical array of PV panels.

Figure 4.3 Typical Anodized Aluminium Frame

Source: Solaire Direct, 2012

Figure 4.4 Typical PV Array

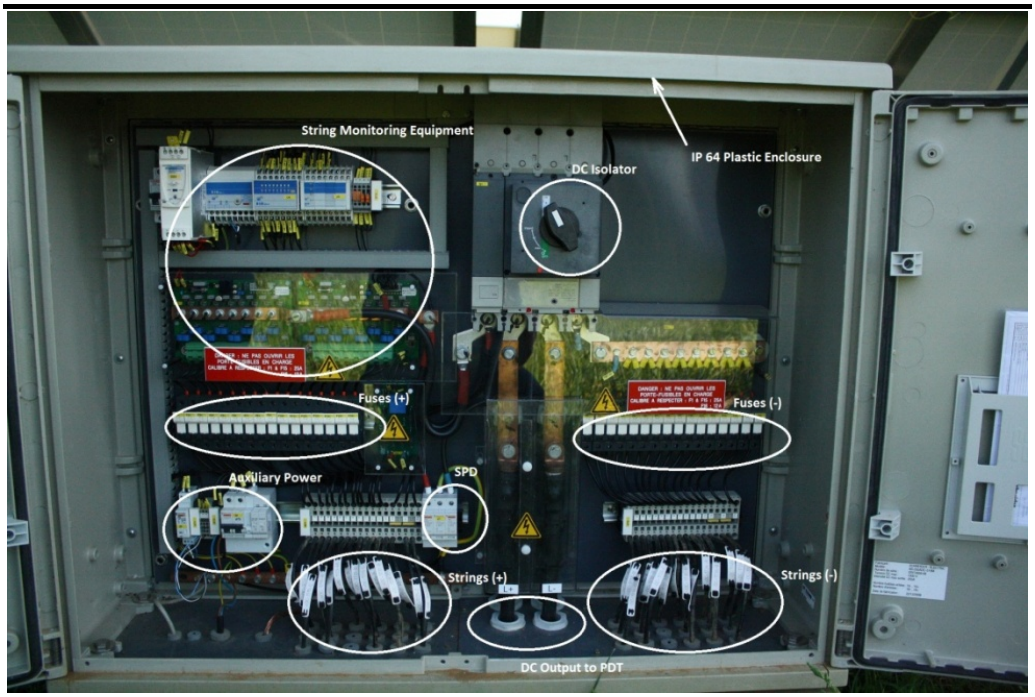
4.4.2 *Electrical Connections and Controls*

The PV panel arrays will be connected via underground cables (800 mm depth) to array enclosures (see *Figure 4.5* and *Figure 4.6*). Array enclosures combine the power generated by many PV panels and transmit that power via two underground DC cables (the array enclosures will be mounted underneath the PV module mounting structures and each array enclosure will occupy an area of approximately 1 m^2) to an inverter/transformer enclosure.

Figure 4.5 Typical Array Enclosure

Source: Solaire Direct, 2012

Figure 4.6 Array Enclosure Components



Source: Solaire Direct, 2012

The inverter/transformer enclosures convert the direct current (DC) produced by the PV panels to alternating current (AC) (see *Figure 4.7*). The inverter/transformer enclosures also contain transformers that transform Low Voltage AC (350V) from the inverter to Medium Voltage AC (22kV). The rated power of each central inverter is 630kW at peak output. Two central

inverters, along with a Low Voltage AC to Medium Voltage AC step-up transformer is placed inside a pre-fabricated concrete container. The container size is approximately 7 m x 3 m x 3.5 m (length x width x height). Between 57 and 60 inverter/transformer enclosures will be required. The inverter/transformer enclosures will connect via underground cabling (depth 800 mm) to a new grid connection substation of approximately 5000 m². The new grid connection substation will be a brick building containing Medium Voltage (22 kV) circuit breakers that will combine the power generated by each inverter/transformer enclosure. This combined power will then be transformed from Medium Voltage (22kV) up to High Voltage (132 kV) for connection to the existing Eskom Drennan Traction Substation by power transformers. The power transformer units will be two 40 MW power transformers or three 25 MW power transformers. The power transformers and associated protection equipment (e.g. circuit breakers) will be installed in the new grid connection substation yard, constructed to Eskom specifications (see *Figure 4.8* and *Figure 4.9*).

Figure 4.7 Typical Inverter/Transformer Enclosures

Source: Solaire Direct, 2012

Figure 4.8 Power Transformer

Source: Solaire Direct, 2012

Figure 4.9 Transformer in Grid Connection Substation Yard

Source: Solaire Direct, 2012

4.4.3 Grid Connection

The 132 kV power supply from the new grid connection substation will be connected to the existing Eskom Drennan Traction Substation, located in the northern part of the site on the east side of the railway line, by two overhead power lines of approximately 250 m in length (see *Figure 4.10*). Both power lines will be installed on the same steel lattice structure, according to Eskom specifications.

Figure 4.10 Existing Drennan Traction Substation

4.4.4 *Auxiliary Electrical Equipment*

The following additional electrical equipment will be required for the project:

- A 200 kVA (10 MW) diesel generator will supply power to security and monitoring systems in the event of a grid failure;
- Security system, electrical fence and 24 hour on site security access control;
- Fire detection system;
- Weather monitoring equipment (rainfall, wind speed/direction, solar irradiation, air moisture) will be located inside or in close proximity to the guard house;
- PV power facility monitoring equipment and associated telecommunication links will be located inside the guard house; and
- Air-conditioning equipment inside inverter/transformer enclosures which will regulate the operating temperature of the inverters.

4.4.5 *Access Roads and Internal Paths*

The site will be accessed from the R310 gravel road running along the eastern perimeter of the site (32^{0}25'29.39" S 25^{0}43'12.68" E). The R310 road links to the N10 national road on the southern corner of the site. The existing gravel road will be upgraded to approximately 6 m in width. This road will provide access to the proposed PV footprint, whether on the western or north eastern portions of the site. Internal paths will be created to enable access within the PV power facility.

Within the PV arrays, a minimum spacing of 6 m is required between each row to avoid shadowing of the panels by adjacent rows. These spaces will not be gravelled or paved. PV power facility maintenance will consist mainly of PV panel replacement, PV panel cleaning and other minor mechanical and electrical infrastructure repairs. Access will be needed primarily for light service vehicles entering the site for maintenance, inspection and PV panel cleaning purposes. During the operational phase, traffic impacts will be less, with vehicles only required to transport infrastructure during routine maintenance and upgrading phases.

4.4.6 Additional Infrastructure

Additional infrastructure that will be required for the project includes the following:

- site perimeter fencing (electrified palisade fencing of approximately 2.8 m in height) including access gates;
- lighting at the main entrance only;
- temporary construction camp of approximately 14,400 m^2 (to house 59 personnel);
- an office for project supervision;
- a meeting room;
- an office for the caretaker of the site;
- two cloakrooms;
- two temporary chemical toilets, due to the fact that there is no water on the site; and
- a lay-down area for the temporary storage of materials during the construction activities of approximately 14,400 m^2.

At this stage it is unknown (but unlikely) whether a borrow pit for rock or soil material will be required for the construction of project infrastructure. A soil stockpile of approximately 18,000 m^2 will be required.

4.5 TRANSPORT, EQUIPMENT AND MACHINERY REQUIREMENTS

During the construction phase, it is expected that potential traffic impacts will be higher than normal as trucks will be required to transport materials and equipment such as PV panels and frames to the site. Infrastructure required for the proposed PV power facility, including support structures, PV modules,

frames, as well as machinery will be transported to and from the site from various locations in the region.

It is anticipated that the following number of trips would be required:

- Delivery of panels: 200 loads consisting of 18.9 tons each on 12 m long trailers.
- Delivery of electrical equipment and components: 28 loads of 20 tons each.
- Delivery of frames: 21 loads of 20 tons each.
- Earthworks: potentially 1400 loads of 10 m^3 each to the identified Local Authority Landfill Site, over the entire construction phase (time period of approximately 9 months).

During the operational phase, it is expected that potential traffic impacts will be less, with vehicles only required to transport infrastructure during routine maintenance and upgrading phases.

4.6 WATER REQUIREMENTS

During the construction phase the primary water use requirement will be for dust control. However, water may also be required to moisture condition the soils for proper compaction at roads and foundations. It is estimated that for dust control and compaction approximately 4,800,000 litres of water will be required (an average of three truck loads per day for the first 60 days of construction and one truck load per day for the following 60 days of construction, with each truck carrying approximately 20,000 litres). Water will also be required for the concrete foundations. It is estimated that 575,586 litres of water will be required for the concrete foundations (with a total of 209 litres/m^3 X 2,754m^3). The estimated construction-related water requirement is 5.4 million litres with a daily usage of 60,000 litres. Temporary ablution facilities will be required during construction (i.e. portable toilets). Water requirements for the construction phase of the PV power facility will be supplied by the Local Water Users' Association.

During the operational phase it is estimated that PV panel cleaning will require a total of approximately 750,000 litres/year (10,000 litres/MW/year). The PV panels will be cleaned manually with a window washer type device (covered with a specialized cloth material), soft brush, window squeegee or soft cloth. A composting toilet will be installed in the guard house requiring no water. During the operational phase, drinking water and process water will also be supplied by existing boreholes and may require treatment for domestic use.

During the operational phase, it is the intention of Solaire Direct to source the required water from an existing reticulation system, either from the local municipality or the landowner. If this is not feasible, alternative options would be to tanker in the required water and / or amend the existing landowner's water use license to include the activity of the required water use.

During decommissioning and site restoration, dust control will be required, and it is anticipated that similar volumes of water as the construction phase will be required. Similar temporary ablution facilities as in the construction phase will be required during the decommissioning phase.

4.7 WASTE MANAGEMENT

All project generated wastes will need to be managed and disposed of in a manner to prevent potential impacts on the environment and risks to human health. A Waste Management Plan (WMP) for the proposed project will be developed. This will follow the principles of waste minimisation at source, segregation for reuse, recycling, treatment or disposal.

All wastes produced from the project activities on site will be temporarily stored in designated waste storage areas. Waste streams will be generated from logistical activities associated with project activities and accommodating personnel.

4.7.1 Waste Types and Quantities Generated

All wastes generated from the project will be categorised as either *non-hazardous* or *hazardous* following an assessment of the hazard potentials of the material, in line with South African requirements. The main sources of waste will result from the temporary construction camp and construction and decommissioning activities. One of the main sources of non-hazardous wastes will be the domestic type solid waste from the approximately 35 personnel at the temporary construction camp. These wastes will be produced daily and comprise of the following:

- Domestic type waste, such as mixed waste from kitchens/canteen or living quarters;
    - residual packaging and food wastes
    - metal cans (from food and drinks)
    - plastics drinks bottles
    - glass jars and bottles
- Wooden pallets and cartons;
- Scrap metal;
- Concrete waste;

- Paper and cardboard;
- Grey water - from showers; and
- Food wastes.

The following hazardous wastes will also be produced from construction activities.

- Batteries (including large lead acid type);
- Medical/clinical wastes - from camp clinic;
- Oily rags and absorbents;
- Used oil and oil filters - from generators or vehicle maintenance;
- Contaminated water - slops and oily water from drip trays; and
- Sewage from toilets.

All wastes produced from project activities on site will be transferred to designated temporary storage areas and where possible into secure containers. Solid wastes will be segregated to facilitate reuse and recycling of specific materials. All wastes that cannot be reused or recycled will be collected by approved waste contractors and transferred to an appropriately licensed waste management facility for treatment and disposal.

4.7.2 Hazardous Materials and Hazardous Wastes

The construction and decommissioning phases will require the use of hazardous materials such as fuels and greases to fuel equipment and vehicles and maintain equipment. These substances will be stored on site in temporary aboveground storage tanks. Fuels on site will be stored in a locked container within a fenced and secure temporary staging area. Trucks and construction vehicles will be serviced off site. The use, storage, transport and disposal of hazardous materials used for the project will be carried out in accordance with all applicable South African regulations. Material Safety Data Sheets for all applicable materials present on site will be readily available to on-site personnel. It is proposed that the construction contracting company supply the required temporary ablution facilities and be responsible for the removal and treatment thereof. Solaire Direct will be responsible to ensure that the contracting company is accredited and has the necessary permits to remove the sewage. The sewage will be treated in accordance with the municipal sewage works policies and guidelines.

Operations and maintenance of the PV power plant is not expected to require hazardous materials to be present and used on site or to generate hazardous waste. PV panels, array enclosures and inverter/transformer enclosures will not produce waste during operation.

The necessary associated sewage services already exist on the site and no additional sewage services infrastructure will be required on the property, e.g. sewage treatment. With respect to this, a composting toilet will be used in the

guardhouse, which makes use of an aerobic process to treat human waste material. The composting toilet requires no water and produces compost-like, odourless, de-hydrated material that could be either disposed of via municipal waste services or be used in the production of compost.

4.7.3 Non-hazardous Wastes

Construction waste will most likely consist of concrete (if concrete foundations are utilised to support mounting structures) mixed with scrap metal. All concrete mixing be undertaken on impermeable plastic lining to prevent contamination of the soils and surrounding areas. Construction solid waste will be managed by an Environmental Management Programme (EMPr) and will incorporate reduction, recycling and re-use principles.

All waste that cannot be reused or recycled will be appropriately disposed of. All construction debris will be placed in appropriate on-site storage containers and periodically disposed of by a licensed waste contractor in accordance with applicable South African regulations. The construction contractor will remove refuse collected from the designated waste storage areas at the site at least once a week. All rubble generated during the construction phase will be removed from the site regularly to a licensed landfill site. It is estimated that approximately 222 m^3 of construction debris will be produced per month, while it is estimated that approximately 0.2 m^3 of solid waste will be generated per month during the 20 to 30 year long operational phase.

4.8 SOCIO-ECONOMIC ASPECTS

The total investment cost of the project is estimated to be approximately R1,350 million.

During the construction phase, the following employment opportunities will be created:

- Site management: 25 employees;
- Civil works: 54 employees;
- Frames & foundations: 27 employees;
- PV modules: 125 employees; and
- Electrical system & components: 60 employees.

Of the PV power facility's employees during construction, 174 employees are estimated to be skilled.

During the operations phase the following employment opportunities will be created:

- General administration and maintenance: 30 employees;
- Compliance related activities: 3 employees;
- Performance monitoring of the PV power facility: 2 employee; and

- Security: 24 employees.

Of the PV power facility's employees during operation, 21 employees are estimated to be skilled.

Certain aspects of the project will provide better opportunities for local employment and economic development than others. The conditions of contract between Solaire Direct and the subcontractor will include requirements for local Enterprise Development addressing the following identified opportunities:

- Electrical system: there will be a requirement for the electrical contractor to make use of local electrical companies for certain elements of the installation of the electrical system. The requirement will be for a minimum of 5% of the subcontract value to be spent on local enterprises.

- Security: there will be a contractual requirement for the security service contractor to subcontract the provision of local security staff to a local company. If such a company does not exist, then the requirement will be for the security service contractor to establish such a subcontractor. The requirement will be for a minimum of 25% of the subcontract value to be spent on local enterprises.

The labour contract between Solaire Direct and contractors who are appointed to provide services during the construction phase of the development will specify local labour employment criteria, e.g. percentage of total workforce.

The labour cost estimate during construction is estimated to be R 3 million, of which local labour is expected to receive 75% (approximately R2.25 million). This estimate excludes the value of manufacturing labour costs. The estimate of the local manufacturing portion of the EPC contract is approximately R 18 million.

Numerous local employment opportunities will be created in the manufacturing process of the PV panels, steel frames, etc. During the operation phase, the PV power plant is expected to generate approximately 8-24 security and 35 operation and maintenance employment opportunities (totalling an estimated R 59 million per year during the first 10 years of operation).

All financial benefits will accrue to beneficiaries, including equity partners, according to Solaire Direct's company structure. Solaire Direct also intends to contribute a portion of the gross profit (before tax and depending on the project stage) to a local community trust that will be specifically set up for this project. The value of this contribution will be determined on finalisation of the tariff as part of the Power Purchase Agreement (PPA).

4.9 PROJECT STAGES AND ACTIVITIES

The project life-cycle can be divided into three key stages as follows:

- site preparation and construction;
- operation (including maintenance and repair); and
- decommissioning.

Each of these stages is outlined in the sections below.

4.9.1 *Site Preparation and Construction*

Prior to construction of the PV power plant, the site will be prepared. Depending on the topography of the proposed layout, site preparation will generally include the following activities:

- vegetation clearance – removal or cutting of any tall vegetation if present (bush cutting);

- levelling and grading of areas where the array will be sited would normally occur, but this is not deemed necessary given the flat nature of the terrain on the site;

- levelling of hard-standing areas, e.g. for temporary laydown and storage areas;

- erection of site fencing;

- construction of a temporary construction camp; and

- upgrading of farm tracks/ construction of on-site access roads.

Once the site has been prepared, prior to the installation of the PV components, the following construction activities will take place:

- the installation of fixed aluminium structures to support the PV modules;
- the construction of the new grid connection substation;
- the construction of electrical and control room;
- the construction of site office and storage facilities, including security and ablution facilities (i.e. composting toilet);
- the construction of array enclosures and inverter/transformer foundations and housing; and
- the installation of cables.

The PV, electrical and structural equipment will be procured in South Africa where available, or from an international manufacturer when sourcing from within the country is not possible. It is expected that these components will be delivered to site via road in small trucks. Once the PV components have arrived on site, technicians will supervise the assembly of the panels and test

the facility. The PV panels will be installed on the fixed aluminium structures anchored to the ground through poles which will be screwed or piled into the ground.

Phased Approach to Construction

The development will be constructed in a phased approach. The exact size of each phase will be dependent on the various consents and authorisations to be obtained for the project, primarily the Power Purchase Agreement. The interconnection technical constraints will also need to be discussed and agreed with Eskom via the Interconnection Agreement. Installation of the full 90 MW could take up to 9 months or more to complete.

During the site preparation period, the workforce required for site security, manual labour, civil works, transportation of goods and other similar services will most likely be drawn from the local labour pool. During the first phase of construction, a highly-skilled team of solar energy technicians (the majority of which would likely be from overseas as a workforce with the required skills is not currently available in the South African market) will train a number of the potential employees, preferably from the province, where available. Up to 291 personnel will be required to construct the full 90 MW PV power facility. However, any accurate employment number is dependent on how the phasing of the project is undertaken. For the purposes of the impact assessment, we have assumed that the development will take place in consecutive phases rather than simultaneously.

4.9.2 Operation

Once each phase of the facility is complete and operational it is expected that it will have a lifespan of at least 20 years. Measuring the performance of the PV power plant will be done remotely, through the use of telemetric monitoring. Day to day facility operations will involve both regular on site preventive and corrective maintenance tasks in order to keep the PV power plant in optimal working order throughout the operational period. Maintenance will consist mostly of panel replacement and other mechanical and electrical infrastructure repairs. Intermittent cleaning of the panels will be carried out as necessary which is anticipated to be once or twice a year. Faulty components will be replaced as soon as problems are identified.

4.9.3 Decommissioning

The PV power facility will be decommissioned after 20-30 years. Alternatively the facility will be upgraded. Solaire Direct intend for the salvage value to cover the cost of decommissioning. Should the plant be decommissioned, the site will be rehabilitated to its original state by applying the following actions:

- PV panels will be removed from the fixed aluminium frames.
- Fixed aluminium frame structures will be removed.

- PV panels will be transported to special recycling facilities (alternatively used at other operational sites).

- Electrical equipment (transformers) will either be re-used on other developments/projects or sold.

- Underground cable runs (where applicable) will be removed.

- Gravel/chipstone on the access roads, onsite service roads, guardhouse foundations will be removed.

- Buildings, such as the guardhouse can be taken over by the landowner for operational purposes, alternately all the reusable material can be removed, the structures demolished and the rubble transported to a municipal waste site.

- Disturbed land areas will be rehabilitated, and replanted with indigenous vegetation if required.

4.10 CONSIDERATION OF ALTERNATIVES

In terms of the EIA Regulations, Section 28(1)(c) and NEMA, Section 24(4), feasible and reasonable alternatives are required to be considered in the EIA process. *'"Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives to –*

(a) the property on which, or location where, it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity (No Go)'.

This section outlines the alternatives considered in for the Drennan PV power facility.

4.10.1 Site Location Alternative

As part of the site selection process a number of potential sites were investigated in the Eastern Cape through a desk-top analysis and intrusive studies. The Drennan site was identified based on a number of criteria, including:

- **Solar resource:** Analysis of available data from existing weather stations suggests that the site has sufficient solar resource to make a solar energy

facility viable. The site is located in one of the most irradiated areas of the country.

- **Site extent:** Sufficient land was purchased to enable sufficient power supply and to allow for a minimum number of PV panels to make the project feasible.

- **Grid access:** Access to the grid and adequate transmission lines were key considerations for site location, i.e. proximity to Eskom's Drennan Traction Substation.

- **Land suitability:** Sites that facilitate easy construction conditions (relatively flat land with deep soft soil and few rock outcrops or waterbodies) were favoured during site selection.

- **Landowner consent:** The selection of sites where the land owners are supportive of the development of renewable energy is essential for ensuring the success of the project.

- **Environmental and socio-economic impacts:** Consideration was given to identifying a site with low agricultural potential, level of biodiversity value and potential visual impacts during site selection.

- **Workforce:** The availability of a potential work force in the surrounding area was taken into consideration.

4.10.2 Site Layout Alternatives

The PV power facility layout and project component design is likely to undergo a number of iterations based on technical aspects of the project such as detailed site specific solar data and construction conditions, and the environmental and social considerations which will be explored during the EIA process.

From a technical perspective, the final PV plant layout will depend on a number of factors including:

- Site-specific topographical conditions;

- Geotechnical features of the site;

- Drainage analysis;

- Final available interconnection capabilities to the Drennan Traction Substation;

- Final dimensions and sizing of structures to be done by specialized engineers to insure that all built equipment will comply with local weather conditions; and

- Any additional inputs, obstacles, or constraints to be identified throughout the EIA and site survey process.

After initial field surveys by the EIA team, areas identified that pose environmental and/or social constraints will be fed back to the technical team in the form of a constraints map, to be generated during the EIA phase. The technical team will then generate a revised site layout taking these environmental and social constraints into consideration. The output of this iterative process will encompass the consideration of layout alternatives and will be used in the assessment of impacts in the EIR.

4.10.3 Technological Alternatives

Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability. There are a number of different solar energy technologies that include:

- Fixed PV plants;
- Tracking PV plants (with solar panels that rotate to follow the sun's movement);
- Concentrated Solar Power (CSP) plants; and
- Concentrated PV Plants.

Financial, technical and environmental factors were taken into account when choosing the type of solar power technology for the site, including the local solar resource and its likely generation output, the economics of the proposed facility and availability of government feed-in tariffs and energy production licenses, and the requirement for other development inputs such as water resource requirements. PV is the most environmentally sensitive technology for the preferred site as large volumes of water are not needed for power generation purposes compared to the CSP option. CSP requires large volumes of water for cooling purposes. PV is also preferred when compared to CSP technology because of the lower visual profile.

The remaining types of technologies were evaluated and the preferred configuration was selected based primarily on the operating environment. The suitability of different types of PV solar panels was assessed including thin film and polycrystalline panels. Based on performance in high temperature environments similar to those typical of the Eastern Cape, thin film panels were selected as the preferred option. The Drennan PV power facility will install fixed structures rather than tracking systems as they require less repair work and maintenance during the operational life of the project. This decision is based on the benefits demonstrated by fixed structures with a longer track record in other markets, showing their high reliance during long

periods of time. High capacity inverters (typically 1 MW) are considered more robust than smaller inverters and thus were selected as part of the preferred configuration.

Fixed Mounted PV System (Preferred Alternative)

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

- The maintenance and installation costs of a fixed mounted PV system are lower than that of a 'tracking' system which is mechanically more complex given that these PV mountings include moving parts.

- Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition replacement parts are able to be sourced more economically and with greater ease than with alternative systems.

- Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.

Dual Axis Tracking System

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

Tracking systems are a new technology and as such are less suitable to operations in South Africa. This is because:

- A high degree of maintenance is required due to the nature of the machinery used in the system, which consists of numerous components and moving parts. A qualified technician is required to carry out regular servicing of these parts, which places a question on the feasibility of this system given the remote location of the proposed project site.

- The costs of the system are necessarily higher than a fixed mounted arrangement due to the maintenance required for its upkeep and its complex design.

- A larger project site is required for this system given that the separate mountings need to be placed a distance apart to account for their tracking movement.

- A power source is needed to activate the tracking system and this offsets a certain portion of the net energy produced by the plant.

4.10.4 Grid Connection Alternatives

The options of connecting the PV power facility to Eskom's national grid are subject to on-going discussions between Solaire Direct and Eskom. The most efficient and practical option which is considered viable for the site is connection into the existing Eskom Drennan Traction Substation located in the northern section of the site. As the existing Drennan Traction Substation is located on the site, connection to this substation with an overhead powerline is considered the most efficient option as the length of the powerline will be relatively short (approximately 800 m). One new grid connection substation will be built (5000 m^2 in size) containing Medium Voltage (22 kV) circuit breakers that will combine the power generated by each inverter/transformer enclosure. This combined power will then be transformed from Medium Voltage (22 kV) up to high voltage (132 kV) for connection to the existing Eskom Drennan Traction Substation by step-up transformers.

4.10.5 No-go Alternatives

The no-go alternative is the option of not implementing the activity or executing the proposed development. Assuming that the solar power plant would not be developed at the proposed site, the site would remain in its current state. However, the agricultural potential (although limited for this site) would not be lost due to the establishment of the facility on agricultural land. Similarly, there would be no positive impacts if the power plant is not executed; there will be no increase in electricity generation, no CO_2 offsets associated with the proposed development, no economic benefit to the landowners associated with the potential income generated through the operation of the facility, and there would be no contribution to meeting South Africa's targets for renewable energy generation.

The direct benefits associated with the both the construction and operational phases of the solar power plant such as increased employment opportunities and associated economic benefits would also not occur should the development not go ahead. It should be noted that requests for employment opportunities have been found to be the overwhelming theme from respondents to consultation activities to date.

The environment consists of interacting geological, biological, social, economic and cultural factors. It is essential that the effects of any proposed development on all aspects of the environment be assessed before a decision to proceed with any proposed development is taken. The environmental and social baseline conditions of the study area for this EIA are described briefly in this section. This description is based on a combination of desk-top research, analysis of maps and aerial photography and an initial site inspection. Further specialist studies will explore issues such as vegetation, visual impact, heritage resources and socio-economic considerations during the next phase of the EIA. The findings of these studies will inform the assessment of the impacts that the proposed development may have on these environmental and social aspects.

5.1 BIOPHYSICAL BASELINE

This section provides an overview of the biophysical components of the receiving environment.

5.1.1 Climate

The climate in the Eastern Cape is highly varied. The west is dry with sparse rain during winter or summer, with frosty winters and hot summers. Cradock normally receives about 248 mm of rain per year, with most rainfall occurring during autumn. It receives the lowest rainfall (4 mm) in August and the highest (46mm) in March. The average midday temperatures for Cradock range from 16.8 °C in June to 29.5 °C in January. The region is the coldest during July when temperatures drop to an average of 2.3 °C during the night (1).

5.1.2 Landscape and Topography

The topography of the area ranges from the semi-arid Karoo plains in the west to the mountainous regions of the southern Drakensberg Mountains in the east. The topography of the proposed Project site itself is largely flat with the altitude increasing slowly towards the west and east beyond the Great-Fish River. To the east of the site is a ridge which runs in a north-south direction and has a high point of approximately 900 metres above mean sea level (mamsl). The topography to east of the site is characterised by undulating hills and mountains (*Figure 5.1*and *Figure 5.2*).

The study area and proposed PV site is characterised by flat and gently sloping topography with an average gradient of less than 10 percent, making

(1) http://www.saexplorer.co.za/south-africa/climate/cradock_climate.asp

the area ideal for intensive agriculture with a high potential for large scale mechanisation.

Figure 5.1 Flat Terrain with ridge to the east

Figure 5.2 Hills and mountains to the south east

5.1.3 Geology and Soils

The geology of the farm Drennan contains Late Permian rocks, which are between 255 and 252 million years old and belong to the Balfour Formation of the Beaufort Group, Karoo Supergroup. These rock formations consist mostly of mudstones and siltstones, which have been intruded in places by dolerite of the Jurassic age.

Most of the northern parts of the proposed site are underlain by mudstone, while Jurassic dolerite (JD) intrusions and terrace gravel and calcrete geological formations are identified to cover the southernmost portion of the site (i.e. Portion 15 of Portion 1 of Farm no. 550), under the proposed location of the 'current PV footprint' (*Figure 5.3*).

Mudstone is a clastic sedimentary rock which is formed from the lithification of deposited mud and clay. Mudstone consists of a very fine grain size of less than 0.005 mm and is mostly devoid of bedding. Jurassic-age dolerite is an igneous rock that extensively intrudes the Beaufort Group as dykes and sheets. In this regard, inclined sheets form crescent shaped or concentric intrusions that are clearly visible on the Middle- and Upper Plateau. Sills range from a few metres to over 100m in thickness. Furthermore, the dolerite typically causes a metamorphosis effect on the adjacent host rocks. Terrace gravel consists of fairly well-rounded cobbles and boulders composed largely of dolerite. These gravels are partly calcrete cemented and occur on terrace remnants that lie from a few metres to a maximum of 30m above the general land surface.

The Drennan site is predominantly underlain by Glenrosa and Mispah type soils (*Figure 5.4*), associated with the following soil-forming processes:

- rock weathering;
- the formation of orthic topsoil horizons; and
- clay alleviation, which gives rise typically to lithucutanic horizons.

Glenrosa soil types are generally shallow soils (i.e. approximately 0.45m in depth) with a clayey texture. Although this soil type is considered to be moderately sensitive to erosion, its subsoil is considered to be more sensitive to erosion and should preferably not be exposed (le Roux, 2012). These soils accommodate mainly short shrubs and have a low agricultural potential that is mainly restricted to grazing (Paterson, 2005). Similar to Glenrosa soil types, Mispah soils are typically very shallow (i.e. approximately 0,2m in depth), with a sandy texture. They are considered to be slightly sensitive to erosion and accommodate a wide variety of short shrub vegetation. The shallow depth of these soil types makes them unsuitable for irrigation and as such they are considered to have a low agricultural potential that is mainly restricted to grazing (le Roux, 2012, Paterson, 2005).

Figure 5.3 Geology Map

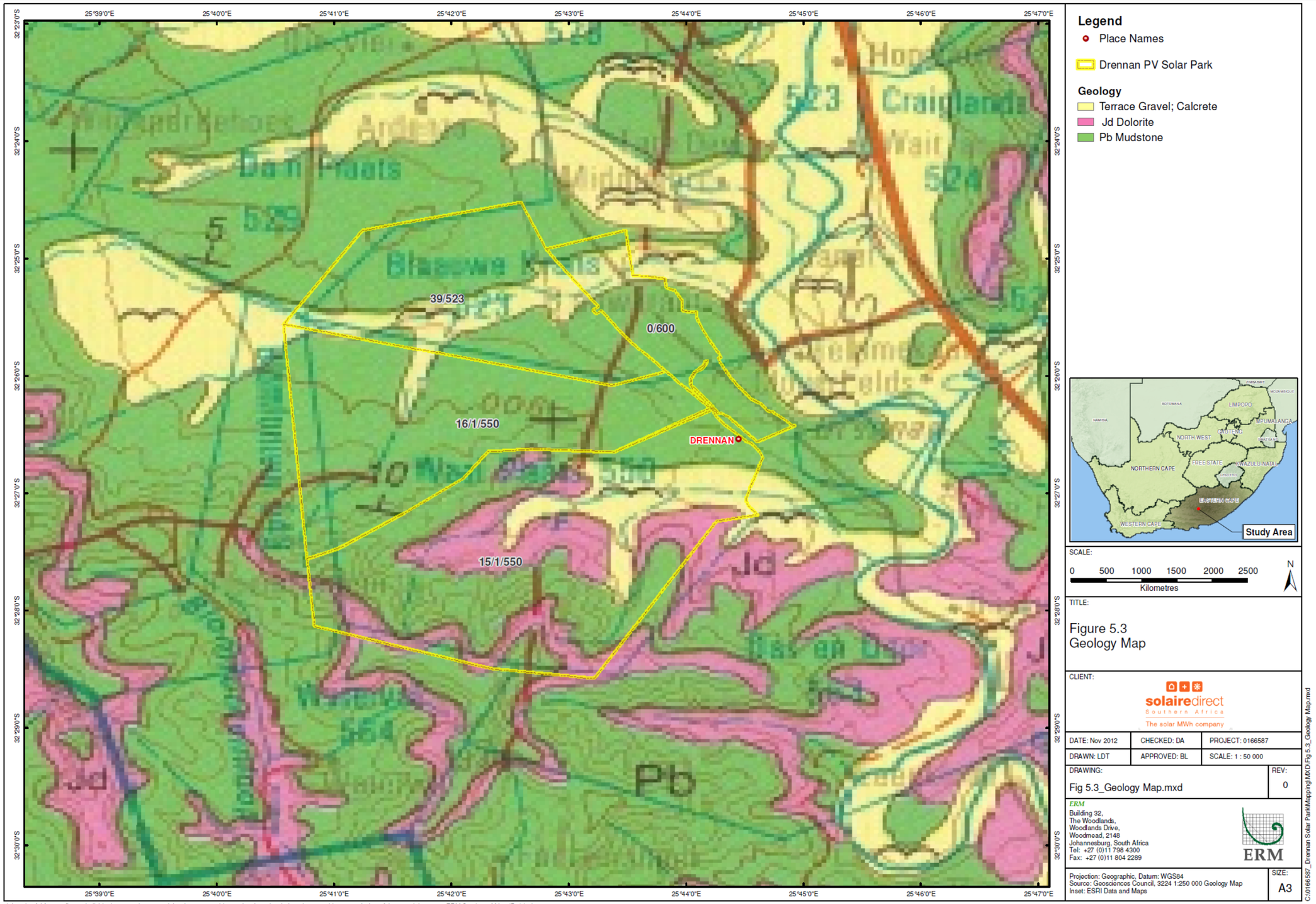
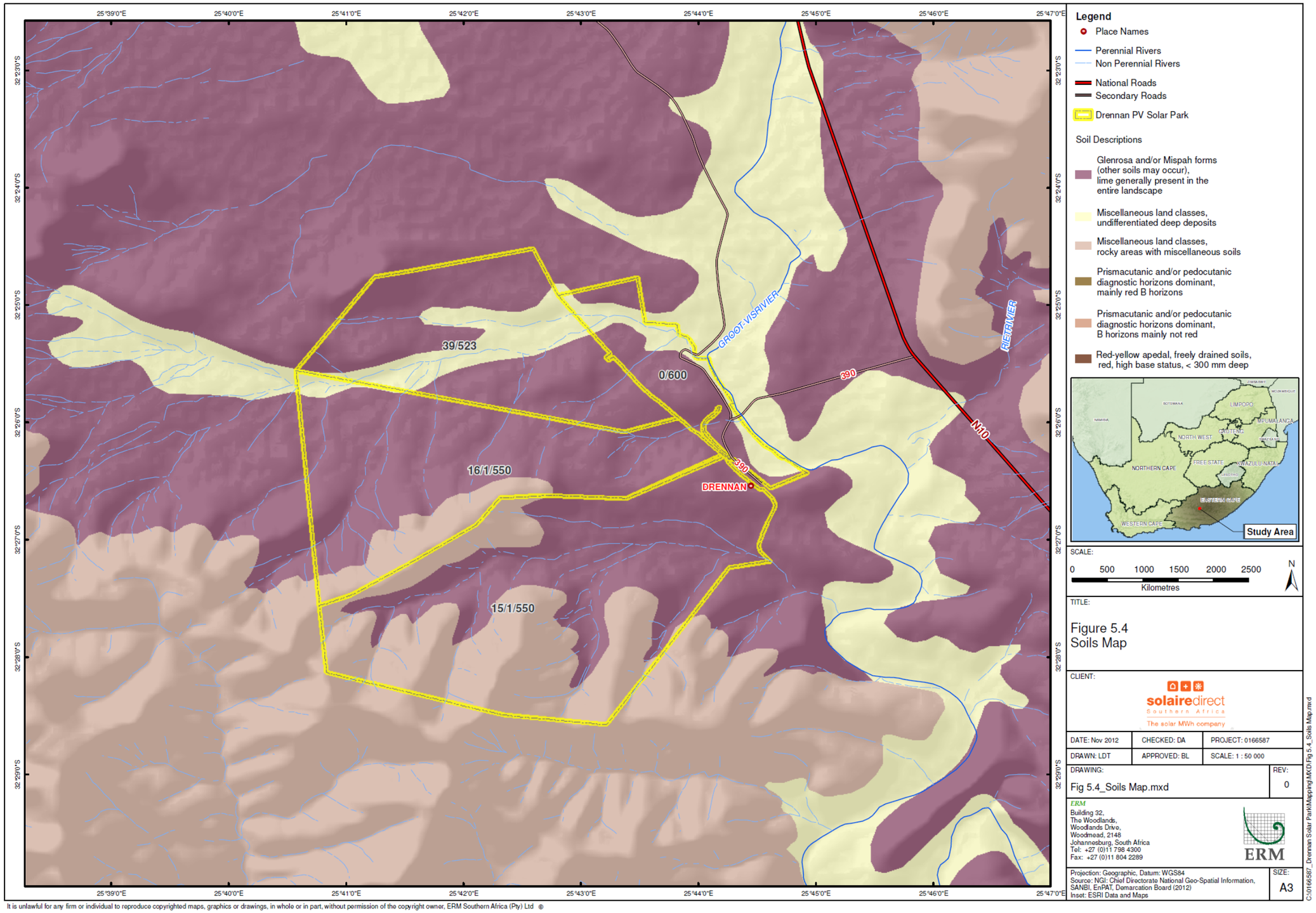


Figure 5.4 Soils Map



5.1.4 Hydrology- Surface Water and Ground Water

The aquifer type for the proposed site is classified as fractured and would likely have a borehole yield of 0.5 to 2.0 l/s (1:500,000 Hydrogeological Map, Sheet 3122, Beaufort West). The subsurface lithology is likely to be predominantly argillaceous rock including shale, carbonaceous shale and siltstone resulting in a groundwater quality of 0 – 70 mS/m[1].

5.1.5 Flora and Fauna

Flora

According to the baseline study undertaken by Simon Todd Consulting (2012), the site is largely dominated by Eastern Upper Karoo, with the drainage areas corresponding to the Southern Karoo Riviere vegetation type. The proposed development area lies entirely within the Eastern Upper Karoo vegetation type, which is the most extensive vegetation type in South Africa and forms a large proportion of the central and eastern Nama Karoo Biome. This vegetation type is classified as Least Threatened, and about 2% of the original extent has been transformed largely for intensive agriculture. The vegetation type is, however, poorly protected and less than 1% of the 21% target has been formally conserved. The Southern Karoo Riviere vegetation type is also classified as Least Threatened. However, since this vegetation type is associated with rivers and drainage lines, those areas classified under this vegetation type should be considered sensitive and development of these areas should be avoided.

There are a number of small dams within the site which have been mapped under the Freshwater Ecosystem Priority Areas (FEPAs). Only one of these is within the proposed development area and is a small man-made dam used for irrigation purposes and is not highly significant from an ecological perspective.

According to the South African National Biodiversity Institute's Integrated Biodiversity Information System (SIBIS) database, sixteen listed plant species are known from the area. A number of protected plant species were observed at the site. Four protected *Aloe* species occur at the site and a permit would be required for the destruction of these plants. None of the *Aloe* species at the site are endangered and the loss of some individuals within the development footprint would not significantly impact the viability of their populations and does not represent a significant ecological issue. A listed plant species, *Euphorbia globosa* was however observed to be common at the site. The presence of this species is a potential concern as it is known from less than 5 locations and is listed as Endangered. The potential impact of the development on this species would depend on the distribution of the development footprint in relation to the plants, as well as the extent and size of the population at the site. If the population is extensive and occurs beyond

[1] mS/m refers to a multiple of siemens (one thousandth of a siemens per meter). Siemens are a unit of electric conductivity.

the site boundaries, then the impact of the development would not be seen as significant. However if the population is restricted and occurs only within the development footprint, then the impact is potentially high. A site visit by the ecological specialist indicated that the *Euphorbia globosa* was abundant on the lower slopes along the eastern edge of the site. It is likely that the species occur more widely given that there do not appear to be any specific attributes which differentiate the study area from the adjacent areas, thus no obvious reasons why it would not occur more widely.

The site is relatively free of alien species. There are some alien plants around the watering points and other disturbed areas, but the veld is generally free of aliens. Alien species observed at the site include *Opuntia ficus-indica* and *Opuntia aurantiaca.*

The site lies within an extensive Critical Biodiversity Area (CBA) corridor. Although this potentially imposes some constraints on the development, it is important to place the CBA map in context. Within landscapes with a high degree of transformation, the majority of intact remnants are classified as CBAs and are significant from a biodiversity perspective simply because they are required to meet the conservation target for the associated vegetation type. However, within semi-arid areas where the vegetation is largely intact, there are usually many options for inclusion into the CBA map and which areas are actually chosen is to some extent arbitrary. The site lies within an extensive CBA which is designed to provide a corridor for movement for fauna and flora. The potential impact of the development on the functioning of the CBA therefore hinges on the extent to which it would disrupt the connectivity of the landscape. Given the relatively limited extent of the development and its proximity to areas of intensive agriculture and human activity, it is not likely that the area surrounding the site acts as an important corridor, and the development of the site is not likely to significantly disrupt the connectivity of the CBA, given the large extent of the CBA relative to the site. The CBA map also does not depict transformed areas within the CBAs and is therefore somewhat misleading as it suggests that the entire CBA is important, despite the fact that there are extensive areas of transformed habitat within the CBA.

Fauna

Mammals

According to the baseline study undertaken by Simon Todd Consulting (2012) there are no fauna that are likely to be a significant issue at the site. The habitat is, however, suitable for common fauna such as the Black-footed Cat which favours a mix of open and densely vegetated areas. The dam and drainage systems which occur at the site would need to be buffered, as they are likely to represent the most important habitat for mammals at the site due to their higher productivity as well as higher levels of cover. There were no additional specific habitats encountered within the development footprint that are likely to be highly sensitive from a faunal perspective.

Reptiles

No listed reptile species are known from the area.

Amphibians

Amphibian abundance at the site is likely to be high within the drainage and floodplain areas, while only those species which forage away from water are likely to regularly occur within the preferred development area. Only the Giant Bullfrog *Pyxicephalus adspersus* is of conservation concern and is listed as Near Threatened.

Avifauna

More than 285 bird species could possibly occur on the site, including up to 18 red-listed species, 72 endemics or near-endemics, and six red-listed endemics (Ludwig's Bustard *Neotis ludwigii*, Blue Korhaan *Eupodotis caerulescens*, Blue Crane *Anthropoides paradiseus*, Cape Vulture *Gyps coprotheres*, Black Harrier *Circus maurus*, Melodius Lark *Mirafra cheniana*). The site is not located close to any established Important Bird Areas (Barnes 1998), although the diversity of species is relatively high, and the reporting rates recorded in the SABAP 1 data (Harrison et al. 1997, (http://sabap2.adu.org.za/index.php)) for a number of red-listed species are also notable. The general area is rich in large terrestrial birds, many of which are listed as threatened. Perhaps partly for this reason, the development site falls entirely within an Eastern Cape Province Tier 1 Critical Biodiversity Area (CBA) (Berliner & Desmet 2007).

The birds most likely to proliferate and become active around the facility, possibly causing fouling problems, could include Speckled Pigeon *Columba guinea*, Greater Kestrel *Falco rupicolus*, Pale Chanting Goshawk, Cape Crow *Corvus capensis*, Pied Crow *Corvus albus*, Cape Sparrow *Passer melanurus* and House Sparrow *Passer domesticus*, and possibly a variety of other perch-hunting and insectivorous passerines.

On the basis of these observations, in combination with already documented information on the avifauna of the general area, 12 priority species are recognized as key in the assessment of avian impacts of the proposed Drennan PV Power Facility (*Table 5.1*). These are mostly nationally and/or globally threatened species which are known to occur, or could occur in relatively high numbers in the development area and which are likely to be, or could be, negatively affected by the PV solar power plant project.

Table 5.1 Priority Bird Species Considered Central to the Avian Impact Assessment Process

Common Name	Scientific Name	SA Conservation Status/ (Global Conservation Status)
Ludwig's Bustard	*Neotis ludwigii*	Vulnerable (Endangered)
Blue Korhaan	*Eupodotis caerulescens*	Near-threatened
Blue Crane	*Anthropoides paradiseus*	Vulnerable (Vulnerable)
Black Harrier	*Circus maurus*	Near-threatened (Vulnerable)
Tawny Eagle	*Aquila rapax*	Vulnerable
Martial Eagle	*Polemaetus bellicosus*	Vulnerable (Near-threatened)
Secretarybird	*Sagittarius serpentarius*	Near-threatened
Lesser Kestrel	*Falco naumanni*	Vulnerable
Lanner Falcon	*Falco biarmicus*	Near-threatened
Black Stork	*Ciconia nigra*	Near-threatened
Yellow-billed Stork	*Mycteria ibis*	Near-threatened

5.2 SOCIOECONOMIC BASELINE

5.2.1 Introduction

The purpose of this section is to describe the socio-economic environment within which the proposed project is located. The proposed development will have benefits on a national level in terms of enhancing electricity supply to the national grid. The potential socio-economic impacts resulting from the proposed project will primarily be experienced at the local level. Therefore, a brief description of the Province and District Municipality is given below, but the socio-economic baseline description is focused on the local level, i.e. the Inxuba Yethemba Local Municipality.

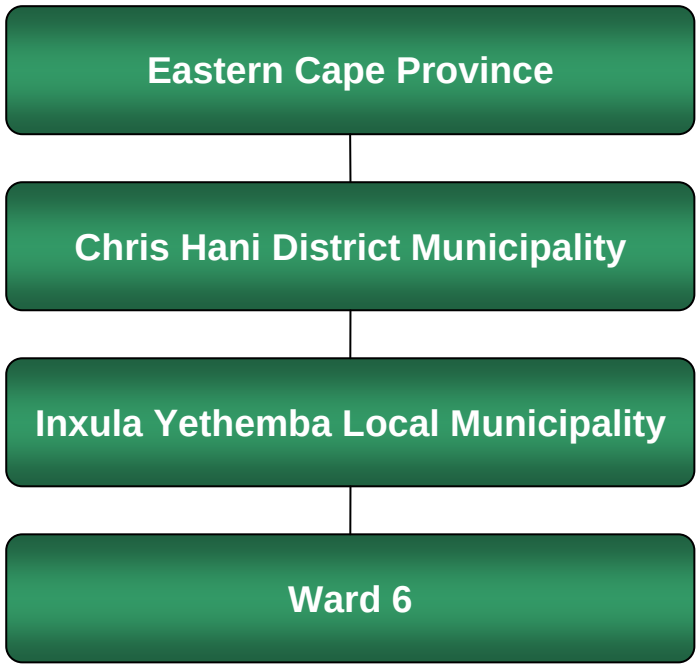
The description provided in this section is based on publically available and high level secondary information. A full and more current account of the project site will be provided as part of the socio-economic study for the EIA, drawing on primary data collected for this project.

5.2.2 Administrative Structure

The project is located within the Inxuba Yethemba Local Municipality, which falls within the Chris Hani District Municipality, in the Eastern Cape (see *Figure 5.5*). Within this administrative structure, the provincial government is responsible for providing a strategic vision and framework for the province,

as well as ensuring cooperation between municipalities and ensuring each municipality performs their respective functions. The district and local municipalities are each responsible for the provision of services and infrastructure within their municipal boundaries. This is facilitated through the development and implementation of Integrated Development Plans (IDPs), Spatial Development Frameworks (SDF) and Local Economic Development (LED) Plans.

Figure 5.5 *Administrative Structure*



5.2.3 Provincial Context

The proposed Drennan Solar Park is located in the Eastern Cape Province, the second largest province in South Africa, measuring 169,580 km^2. There are two primary metropolitan areas within the Eastern Cape, namely, Port Elizabeth and East London. Smaller district towns include Grahamstown, King Williams Town, Queenstown, Bisho and Mthatha. There are small towns scattered along the coast of the Province. Two former homelands, the Transkei and the Ciskei, have been incorporated into the Eastern Cape.

The Eastern Cape is the third most populous province in South Africa, containing approximately 13.5 percent of national population (Chris Hani IDP, 2011/12). However, it is also the poorest province in South Africa, with a poverty rate(1) of 68.7 percent. Poverty rates differ vastly between racial

(1) The poverty rate is defined as the number of people earning less than the minimum level of income deemed adequate in a country. The World Bank uses the figure of $1.25 per day.

groups, with low poverty rates among the White and Asian populations, and high poverty rates among Coloured (48.7 percent) and African (73.8 percent) population groups [(1)]. Just under two thirds (61.5 percent) of the population live in rural areas, which is the opposite of the national trend, where the average urban-rural split 63-37 [(2)].

The Eastern Cape faces the challenge of high unemployment rates and low income levels. The unemployment rate in the Province is 27.1 percent, which is above the national average of 23.9 percent [(3)].

5.2.4 The Chris Hani District Municipality

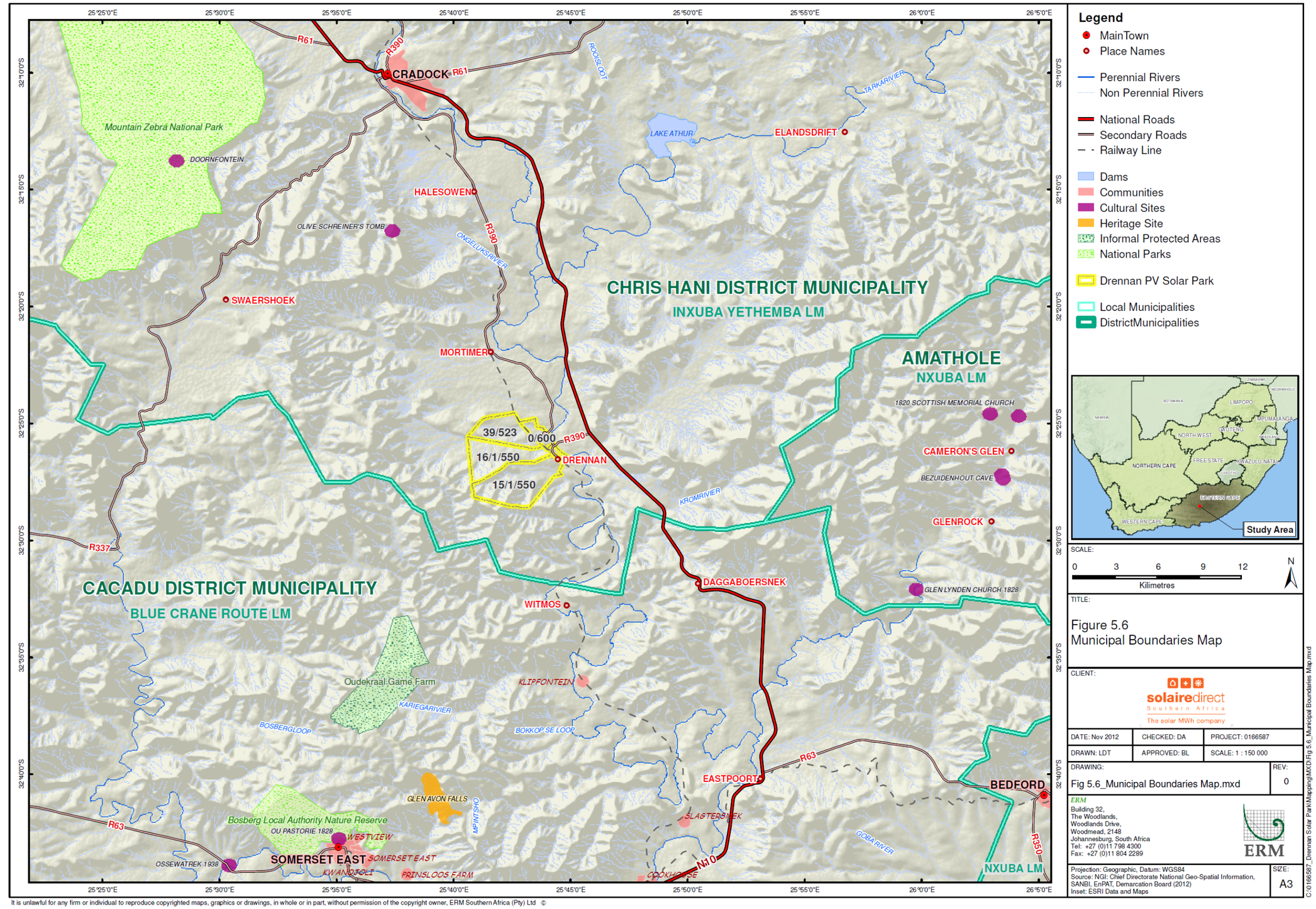
The Chris Hani District Municipality is one of seven District Municipalities in the Eastern Cape. It is located inland, roughly in the centre of the Province and is approximately 36,561 km² in size. There are eight Local Municipalities (LM) within the District Municipality, namely, Emalahleni LM, Engcobo LM, Inkwanca LM, Intsika Yethu LM, Inxuba Yethemba LM, Lukhanji LM, Tsolwana LM, and Sakhisizwe LM.

According to the 2007 Community Survey, the population of the Chris Hani District Municipality is approximately 798,597, accounting for 13 percent of the total population in the Eastern Cape. A large portion of the population (54.4 percent) within the District is between the age of 5 and 20 [(4)]. This reflects a Province wide occurrence and may be linked to the fact that the Eastern Cape has a long history as a labour sending area.

The Chris Hani District Municipality is considered largely rural, with small to medium urban centres, such as Queenstown, Middleburg, Lady Frere and Cradock. Like the Eastern Cape Province as a whole, the Chris Hani District Municipality also faces high poverty rates, with an estimated 56.6 percent of the population living in poverty. As with the Provincial trend, the poverty rate is more prevalent in the African (57.8 percent) and Coloured (57.4 percent) population groups.

(1) PROVIDE Project Background Paper 2005.
(2) PROVIDE Project Background Paper 2005.
(3) Unemployment rate for Q4 2011 according to Statssa.
(4) Chris Hani IDP, 2011/12

Figure 5.6 *Map showing Municipal Boundaries*



5.2.5 The Inxuba Yethemba Local Municipality

The proposed Drennan Site is located within a rural setting along the N10 and is approximately 57 km south of the town of Cradock. The Site is situated on the remaining extent of Farm Drennan, including:

- Portion 39 of farm 523;
- Portion 0 of farm 600; and
- Portions 15 and 16 of Portion 1 of Farm Waai Plaats (no. 550), Cradock.

There is approximately 400 ha of land available at the site for the construction of the proposed Project.

The Inxuba Yethemba Local Municipality (IYLM), one of the eight local municipalities within the Chris Hani District Municipality, is approximately 11,592 km^2 in extent. The administrative centre of the IYLM is located in Cradock. There are nine Wards within the Municipality and the Drennan site is located in Ward 6. The Great-Fish River runs through the IYLM and is important from an agricultural perspective. The N10 National Road bisects the Municipality from north to south.

The sections below provide a detailed description of the socio-economic conditions in the IYLM. As mentioned above, this section is based on publically available and high level secondary information.

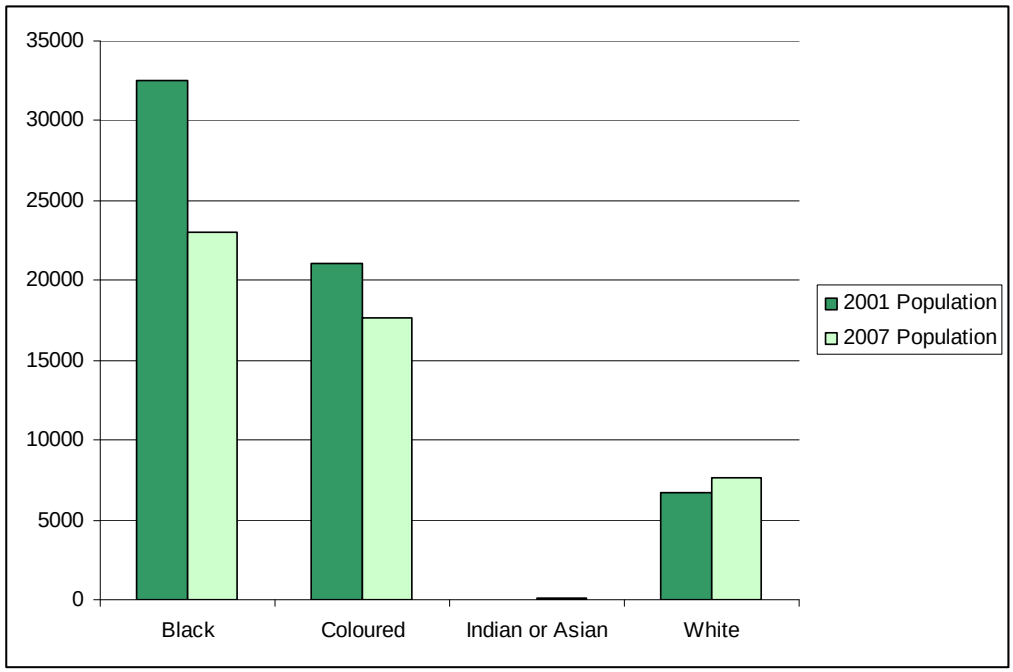
Population Demographics

The population in the IYLM was an estimated at 48,400 at the time of the 2007 Community Survey. This shows a decrease in the population size by 24 percent (11,894) since the 2001, when the population size was 60,294 (1). This decrease could be attributed to the out-migration of job seekers from the IYLM and the Eastern Cape in general, in search of opportunities in other provinces and urban areas. As mentioned above, the Province has historically been a labour sending area. This notion is support by the fact that the largest decrease in population appears in the African population group, as shown in *Figure 5.7* below, who have typically been associated with migrant labour in the past.

Females represent 54 percent of the population within the IYLM, while males account for 46 percent. This gender split may be linked to the number of males leaving the area in search of employment. It must be noted that according to the IYLM IDP 2011, within Ward 6, the gender split is the opposite, with a greater percentage (55.9 percent) of the population being male. The racial composition of the IYLM comprises of 48 percent Africans, 36 percent Coloured and 16 percent White people (2).

(1) Statistics South Africa, Community Survey, 2007
(2) Community Survey, 2007

Figure 5.7 Population Change in IYLM from 2001 to 2007, by Population Group



Source: Statistics South Africa: Community Survey, 2007

Education

General education levels are low within the Inxuba Yethemba Local Municipality. An estimated 11.4 percent of the population over 20 years of age are regarded as illiterate, as they have not received any schooling. It is estimated that 73 percent of the population over 20 years have completed schooling (from Grade 0 to Grade 12). However, a low 10.4 percent have attained a higher education qualification (1). Almost two thirds (64.7 percent) of those with a higher education are White, while only 35.2 percent are African or Coloured. This could indicate that there is a lack of highly skilled previously disadvantaged people within the Municipality. A higher percentage of females (55 percent) have completed schooling, which accords with the 54 - 46 gender split within the IYLM, as mentioned above.

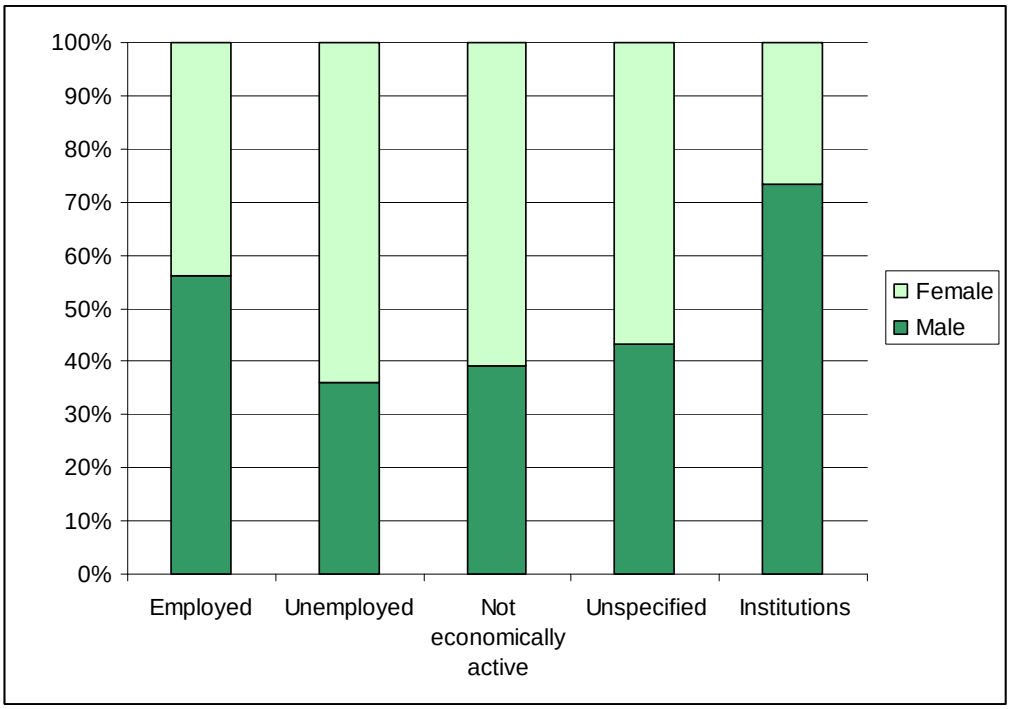
According to the IYLM IDP, there are 23 crèches and 22 primary schools within the Municipality. However, there are only two pre-primary schools, seven secondary schools and two tertiary educational facilities within the Municipality. Within Ward 6 there are four primary schools, but there is only one crèche and no secondary schools or tertiary education facilities. A key challenge for the IYLM is that education facilities are not distributed evenly around the Municipality and that many crèches and pre-primary schools have been established in inadequate structures.

(1) Statistics South Africa, Census 2001

The economically active population (aged 16 – 65 years) of the IYLM was estimated to be 29,414 people in 2007, making up 60.7 percent of the total population. Of that total, 38 percent are employed, while 23 percent are unemployed. A further 33 percent are considered economically inactive (1). The unemployment rate in IYLM is lower than that of the Province (27.1 percent), and is in line with the National unemployment rate of 23 percent.

There is a discrepancy in the employment rate between male and female, with males comprising just over 55 percent of the employed population within the IYLM, see *Figure 5.8*. Females make up a significantly larger portion of the unemployed and economically inactive population, as shown in *Figure 5.8* below. *Figure 5.9* shows that the unemployed and economically inactive population consists largely of previously disadvantaged South Africans, i.e. African and Coloured groups. In contrast, unemployment is very low among the White population group.

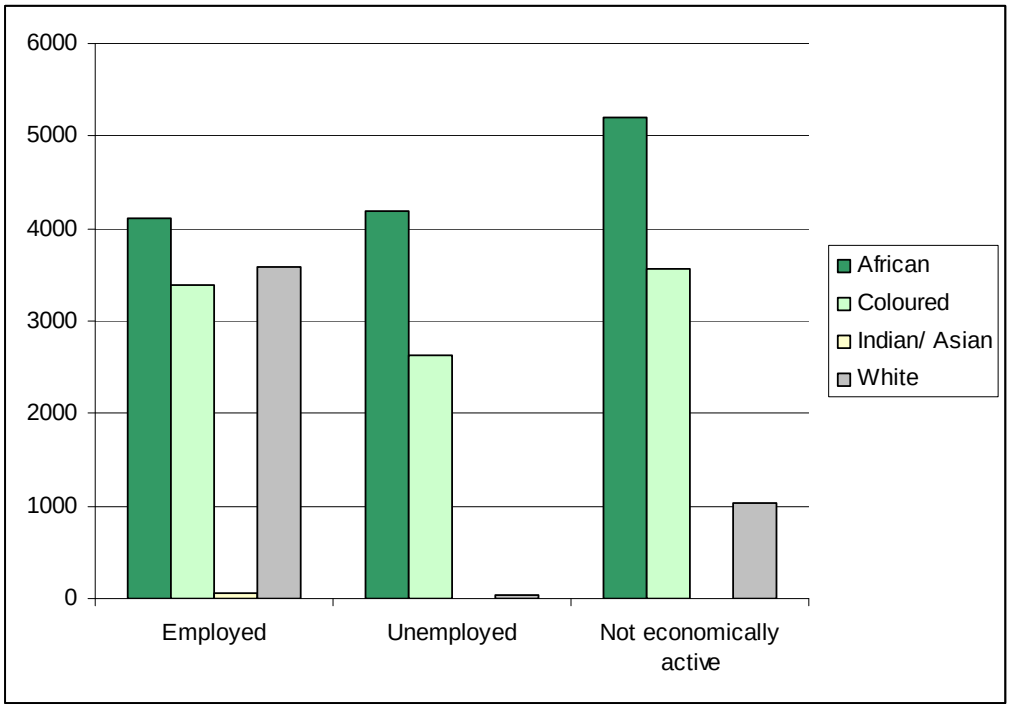
Figure 5.8 Employment by Gender in 2007



Source: Statistics South Africa: Community Survey, 2007

(1) Economically inactive population refers to students, elderly, sick, differently-abled persons and people who choose not to work.

Figure 5.9 Employment by Race in 2007

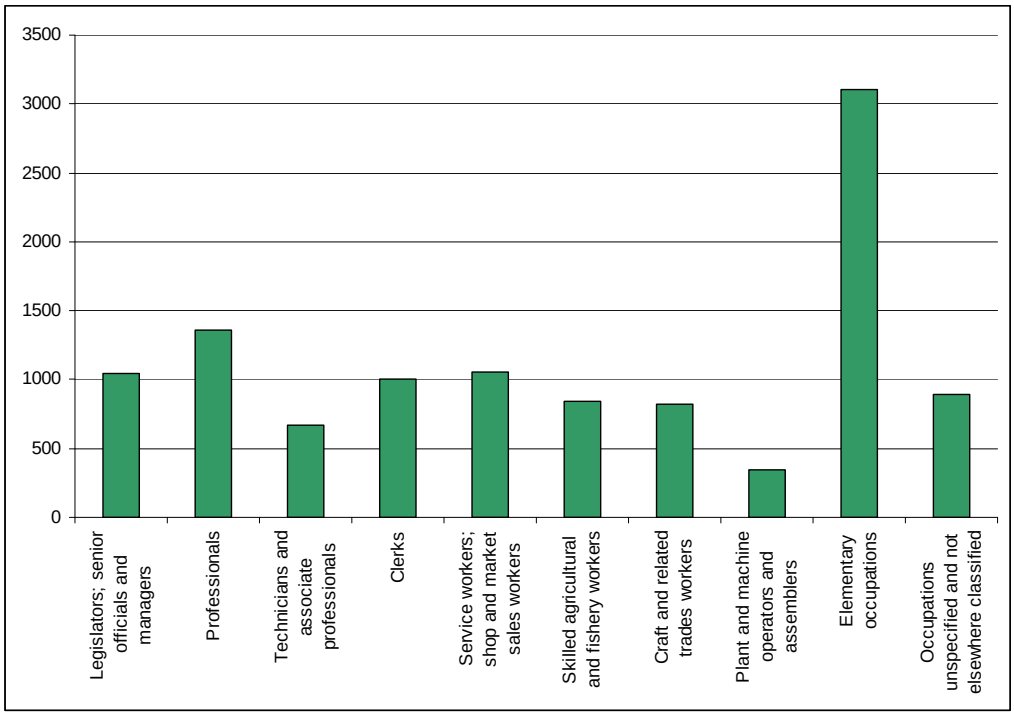


Source: Statistics South Africa: Community Survey, 2007

The main occupations undertaken by those living in the IYLM are shown in *Figure 5.10* below. *Elementary occupations*, i.e. occupations which require unskilled labour, were the dominant occupation (29 percent) in 2007 (1). Twelve percent of the IYLM undertake what is categorised by Statistics South Africa as *professional occupations*. Other occupation categories that comprise a relatively higher proportion of jobs undertaken within the IYLM (approximately nine percent each) include *clerks*, *legislators and senior officials*; *service workers*; and *shop and market sales workers*. *Skilled agricultural workers* make up eight percent of the occupations within the IYLM. The high percentage of people with elementary occupations reflects the lack of skills training and higher education in the IYLM, and the low numbers of people with *professional occupations* may be influenced by the lack of availability of such jobs, given the rural nature of the area.

(1) Statistics South Africa: Community Survey, 2007

Figure 5.10 Primary Occupations within the Local Municipality



Source: Community Survey, 2007

According to the Community Survey 2007, *community, social and personal services* are the primary employment sector within the IYLM, employing approximately 23 percent of the working population (see *Table 5.2*). The next most dominant sector is *agriculture, hunting, forestry and fishing*, employing 17 percent of the working population, followed by *wholesale and retail trade*, employing 13 percent [(1)]. As shown in *Table 5.2,* other sectors such as *manufacturing* and *construction and transport*, each employ less than ten percent of the population.

Table 5.2 The Main Employment Sectors in 2007

Sector	Percentage
Agriculture, hunting, forestry and fishing	17%
Manufacturing	10%
Mining and quarrying	0%
Community, social and personal services	23%
Wholesale and retail trade	13%
Construction	6%
Electricity, gas and water supply	0%
Financial, insurance, real estate and business services	7%
Transport, storage and communication	4%
Undetermined, unspecified	20%

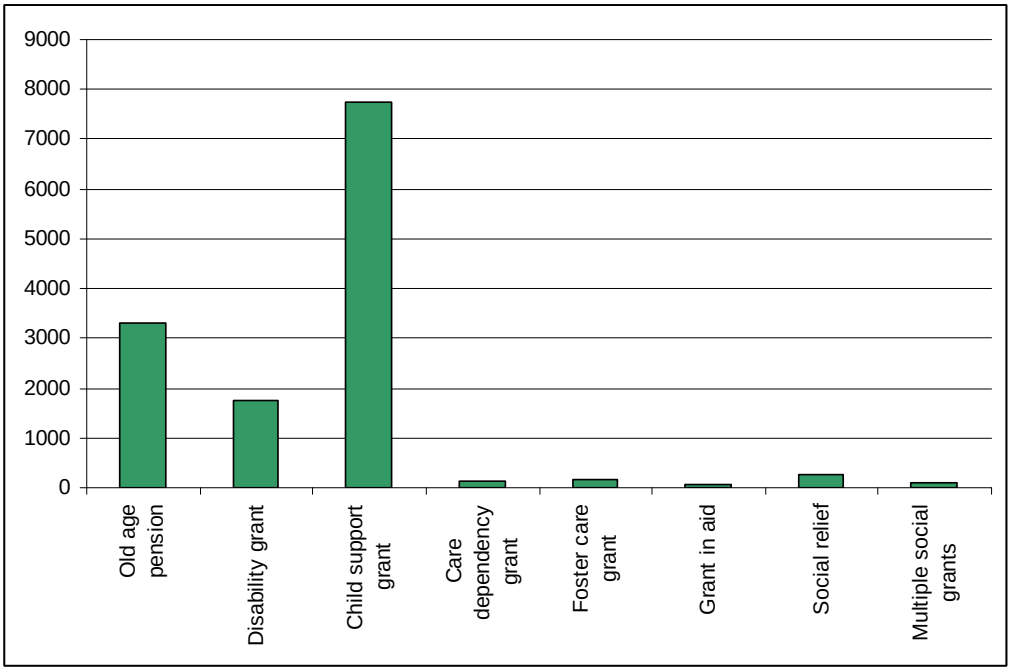
Source: Community Survey, 2007

(1) Statistics South Africa: Community Survey, 2007

Within IYLM, 41 percent of the economically active population reported that they had no income in the 2007 Community Survey, while 38 percent reportedly earn a low income of below R 1,600 per month. A smaller number, 10.5 percent, earn between R 1,601 and R 12,800 per month. Only 1.4 percent earn between 12,801 and 52,200 per month, and 0.1 percent reported earning above R 51 200 per month [1]. The high percentage of people who earn low to no income can be attributed to the high unemployment rate and dominance of elementary (unskilled/ low skilled) occupations in the Municipality.

In addition to low income levels, a significant portion (28 percent in 2007) [2] of the IYLM population are dependant on receiving social grants from the Government. As shown in *Figure 5.11* the main social grants received by people in the Municipality are child support grant grants (58 percent), old age pensions (24 percent) and disability grants (13 percent).

Figure 5.11 Social Grant Recipients in 2007



Source: Statistics South Africa: Community Survey, 2007

Local Economy

According to the Inxuba Yethemba Local Mucipality IDP, the most significant contributors to the municipal Gross Geographic Product [3] (GGP) are Finance and Business Services (22 percent), General Government Services (21 percent), Trade (18 percent) and Agriculture (10 percent). The IYLM contribution to the National GDP was approximately 0.1 percent in 2007. It is noted in the IDP

(1) Statistics South Africa: Community Survey, 2007

(2) Statistics South Africa: Community Survey, 2007

(3) The gross geographic product (GGP) of a particular area amounts to the total income or payment received by the production factors – (land, labour, capital, and entrepreneurship) – for their participation in the production within that area. (http://www.environment.gov.za/enviro-info/nat/ggp.htm).

that contribution of agriculture to the GGP has declined from 20 percent in 1995 to 10 percent in 2007, largely due to negative growth in this sector. However, agriculture remains an important employer within the Municipality. Tourism has been identified as a potential growth sector within the IYLM and this is discussed in more detail under the *Tourism Activities* heading below.

Surrounding Landuse

As mentioned above, the Drennan Site is located in a rural setting, south of the town of Cradock. The land-use in the surrounding area consists predominantly of agriculture, in the form of livestock grazing, as well as cultivation which is undertaken alongside the Great-Fish River. These are discussed in more detail below.

Agriculture

As mentioned above, despite that fact that the contribution to the GGP made by agriculture within the IYLM has been steadily declining, it remains an important sector in the Municipality. There are two primary types of farming activities that take place in the area, namely, dryland farming and intense irrigation farming. The irrigation farming takes places along the Great-Fish and Tarka Rivers, where water from the rivers can be used to irrigate lucerne, wheat, oats, maize and vegetables. The irrigated fields also facilitate dairy farming. The drylands farming in the area consists of stock farming, (sheep, cattle, goats), ostrich farming and game. The Drennan site is considered dryland, with a small section of irrigated land to the north east of the proposed Project site.

There are some emerging farmers in the IYLM, with two groups in the Middleburg area and 12 groups in the Cradock area. According to the IYLM IDP, the emerging farmers mostly farm the same piece of land in groups, and these commonages are rented from the municipality. The challenges that emerging farmers face include a lack of appropriate skills and access to training, little support from government and access to agricultural finance.

Tourism Activities

The site is located along the N10 National Road, which connects the coastal city of Port Elizabeth to the inland towns of Bloemfontein and Kimberley. Middleburg, Cradock and the surrounding areas are convenient stopover locations along the N10, therefore, much of the domestic tourism in the area consists of people passing through the area and overnight stays. The IYLM IDP notes that there is opportunity to grow the tourism sector. However, there are a number of constraints, primarily the lack of cohesion amongst operators, the long distances between tourist attractions and lack of support from government, whose focus is more on coastal towns.

The Mountain Zebra National Park is located 36 km north west of the site. There are no other statutory nature reserves or national parks within a 50 km

radius of the site. A number of private game reserves occur in the Eastern Cape, but none appear to be located within 50 km of the Drennan Site. Other attractions in the area include historical buildings in Cradock and Middleburg, rock art, agritourism and the natural landscapes of the Karoo.

Existing Infrastructure on the Project Site

A landowner's dwelling is located on the north eastern portion of the site, between the rail line the Great-Fish River. There are two farm dams located along drainage lines within the Project area, and an irrigated pasture near the north eastern boundary of the site where pivot agriculture has been undertaken. There is an existing 400 kV overhead transmission line that traverses the site and links into an existing substation on the site. There is a railway line that traverses the eastern portion of the site in a north-south direction. The fencing and gates on site are well maintained.

Figure 5.12 View of Site, Looking South, Showing Existing Railway Line

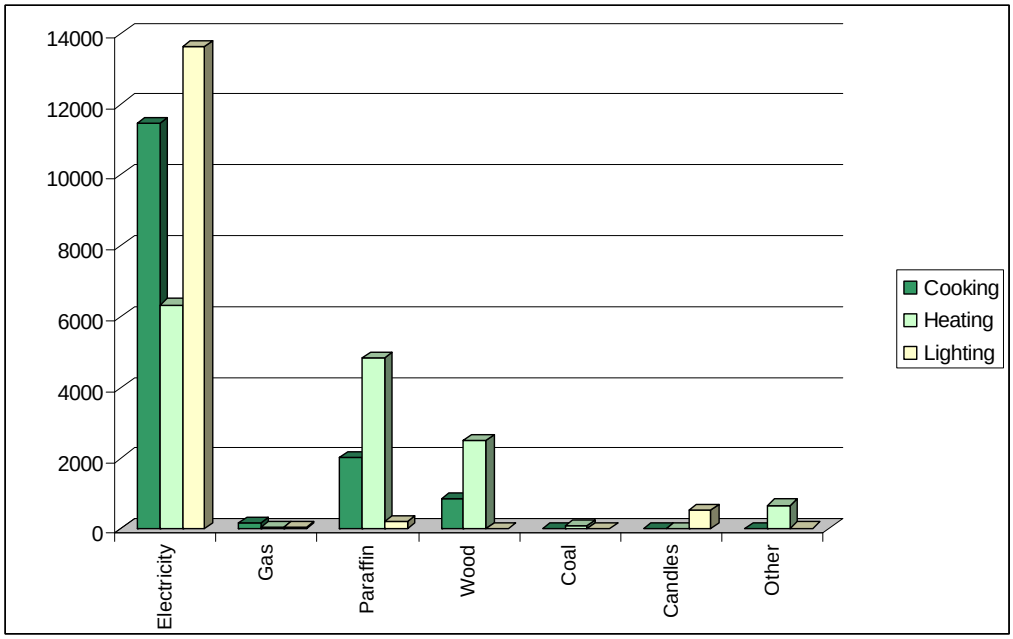
Health

According to the IDP, there are two hospitals and eight clinics in the IYLM. The IDP has identified the need for mobile clinics within the IYLM, as the travel distances required to access health facilities are significant for those living outside the urban area. Other challenges include insufficient clinic staff and lack of medicine in all the clinics. The HIV/AIDS infection rate within the IYLM has increased by eight percent between 1995 and 2007.

Energy

The majority of the households within the IYLM (94 percent) have access to electricity. It is primarily used for lighting, heating and cooking, as shown in *Figure 5.13* below. Households that do not have access to electricity make use of other sources of fuel. For example, paraffin is used for cooking by 14 percent of the households in the IYLM, and for heating by 33.5 percent of the households. Wood is used for heating by 17 percent of the households (Community Survey 2007).

Figure 5.13 Household Energy Sources and Uses in 2007



Source: Statistics South Africa: Community Survey, 2007

Water

According to the 2007 Community Survey there is good access to water within the IYLM. An estimated 52 percent of households in the IYLM have access to tap water inside their homes, while 39 percent have access to water outside their homes (within their yard). Three percent of households have access to piped water from an access point outside of their yard and six percent do not have access to piped water and obtain water from boreholes.

Housing

The majority (91 percent) of the population of the IYLM live in a house or brick structure on a separate stand or yard, while 3 percent reside in a house/flat/room in a back yard. Only 1.1 percent of the population live in traditional or informal dwellings (1).

(1) Statistics South Africa: Community Survey, 2007

Access to technology

In 2007, only four percent of households within the IYLM had access to the internet, and 12 percent to a computer. In contrast, an estimated 61 percent of households had access to a cell phone.

5.2.6 Palaeontology, Archaeology and Cultural heritage

Paleontological Background

The geology of the Drennan site contains Late Permian rocks, which are between 255 and 252 million years old and belong to the Balfour Formation of the Beaufort Group, Karoo Supergroup. These rocks consist mostly of mudstones and siltstones. The Beaufort Group is world-renowned for its rich fossil record. They contain some of the most significant evidence for the origins of dinosaurs, mammals and turtles. The rocks of the Beaufort Group are sub-divided into assemblage zones according to the various vertebrate fossils found in each zone. Drennan falls within the Dicynodon Assemblage Zone, named after the most common dicynodont therapsid fossil found in the zone. The Dicynodon Assemblage Zone fauna include fish, amphibians, reptiles and numerous species of therapsids (the ancient ancestors of mammals). A tiny portion of the sediments on Drennan are intruded by non-fossiliferous Early Jurassic Karoo dolerite. Superficial deposits of non-fossiliferous alluvium cover approximately 40% of the Drennan site.

Archaeological Background

Very little is known of this part of the Eastern Cape as little systematic archaeological work has been done. The Albany Museum in Grahamstown has received donations of stone implements from members of the public from as early as the 1880s. Many of these collections were received from the Cradock area, where freshwater mussel middens containing stone implements and pottery were recorded from the banks of the Great-Fish River.

It is therefore anticipated that the study area will contain artefactual material dating to the Early Stone Age and Middle Stone Age of the Pleistocene epoch (3 million – 20 000 years ago). This material is often noted in eroded areas, or on terraces in river valleys.

It can be predicted, with confidence, that there will be Later Stone Age sites within the study area. These are attributed to the ancestors of the San people and Khoekhoen pastoralists (after 2000 years ago). The legacy of the San includes numerous open sites while traces of their presence can also be found in most large rock shelters, often in the form of rock art. They frequently settled a short distance from permanent water sources (springs or waterholes) and made use of natural shelters such as rock outcrops or large boulders. In the Great Karoo natural elevated features such as dolerite dykes and ridges played a significant role in San settlement patterns. The introduction of pastoralism (sheep and goats, later cattle) roughly 2000 years ago, along with the arrival of the Khoekhoen, was a significant event that broke the ancient tradition of hunting and gathering. According to the historic records, the

Khoekhoen herders were divided into large tribal communities, distributed along the coastal plains and up as far as Graaff Reinet. These communities in transition (herding cattle and sheep) may have utilized the grazing opportunities of the Karoo on a seasonal basis but information on this is sketchy. The San appear to have retreated to the Great Karoo with the arrival of the first Dutch Trekboers in the mid-18th century. Here they managed to eke out an existence which includes hunting, gathering and raiding the livestock of the Trekboers, resulting in the "Bushman War" which continued for almost 60 years. Eventually the *kommandos* which were dispatched from regional centres such as Graaff Reinet prevailed, and the "wild bushman" of the Karoo were rendered extinct by the early 19th century.

Historical Background

In 1813, the Cradock Proclamation gave the right to Loan Place holders to apply for their lands to be granted to them in Perpetual Quitrent. "By 1840, swarms of these contiguous quitrent farms were in place, separated by vast, unchartered tracts of Crown Land which served, among other things, as a refugium for surviving Bushmen" (Sampson 1994a: 65).

Farmers were urged to make peace with the San through gifts of meat, tobacco and trinkets. Between 1825 and1840, travellers reported increasing numbers of farm Bushmen acting as herders and servants. By the 1840s, when the first towns sprung up around the valley, most unattached Bushmen were partly acculturated and some were drawn into slum communities where they lost their identities.

According to Fransen (2006), Cradock was proclaimed a town in 1814 although the first buildings were only constructed in 1818. The town became a municipality in 1873.

6 PRELIMINARY IDENTIFICATION OF IMPACTS

6.1 INTRODUCTION

A key part of the Scoping Process is a preliminary identification and consideration of the ways in which the project may interact (positively and negatively) with environmental and socio-economic resources or receptors. The issues that are identified as potentially significant during the Scoping Process provide focus for more detailed specialist studies for the EIA. Each of the potential issues will be briefly described in this section while the significance of any resulting impacts will be discussed and assessed in more detail in the EIR.

6.2 DESCRIPTION OF POTENTIAL IMPACTS

The potential impacts on environmental and social resources arising from the proposed development include direct and indirect impacts. Potential impacts will also be linked to the different stages of the project which are identified as construction, operation and decommissioning.

Table 6.1 provides an overview of likely aspects arising from each of the key project activities and considers their likely interaction with socio-economic and environmental resources and receptors.

Table 6.1 Interaction between Project Activities and Receiving Environment

Project Activities	**Receptor/Resource**									
	Fauna (including Avifauna)	Flora	Soils	Hydrology	Traffic and Transport	Air Quality	Land Use and Agricultural Potential	Landscape and Visual Amenity	Heritage/Archaeology/Palaeontology	Socio-economics
Pre-construction and Construction										
Clearance of Vegetation										
Construction of Access Roads										
Construction of Temp. Construction Camp										
Site Levelling and Grading										

Underground Cables/Overhead lines	■	■	■	■					■	■
PV Panel Delivery and Erection								■		■
Construction of Service Building				■				■	■	■
Construction of New Grid Connection Substation				■				■	■	■
Hard Standing Area Rehabilitation	■	■	■					■		■
Operation										
PV Panel Operation								■		
Use of Access Roads	■							■		
Use of Buildings	■							■		
Site Maintenance and Security										■
Decommissioning										
Removal of PV Panels	■	■						■		■
Removal of Foundations	■	■		■				■		■
Removal of Access Roads	■	■		■				■		■
Removal of Underground Cables	■	■						■		■
Site Restoration & Rehabilitation	■	■	■	■		■		■		■

Note: This interactions matrix will be continually developed throughout the EIA process.
Key: Shaded box indicates potential interaction between the project and resource or receptor.

6.3 POTENTIALLY SIGNIFICANT ISSUES

The following section describes potentially significant issues based on the initial site visit, discussions with the project team, issues and concerns raised by I&APs during the initial notification process, and available information about the environmental effects of similar solar energy developments. It is likely that many of these impacts can be adequately addressed through the implementation of appropriate mitigation and management measures. However, some require further specialist investigation as part of the EIA as indicated.

6.3.1 Noise and Vibration

During the construction phase, construction vehicles including delivery trucks and minimal excavation equipment may produce a slight increase in noise disturbance. Impacts are likely to be minimal due to the methods of construction to be used, i.e. poles will be hammered into the ground by hand as opposed to mechanically pile driven by machinery. Delivery vehicles will also create some noise and vibration along access routes. The site, however, is located in a rural setting with few or no receptors considered sensitive within close proximity.

Increased noise levels are not anticipated during the operational phase of the development.

Potential noise impacts will be addressed in the EIR and appropriate mitigation measures if considered necessary will be included in the draft Environmental Management Programme (EMPr).

6.3.2 Dust

Limited dust generation may occur during vegetation clearance, transportation of materials for construction, cable trenching and the construction of buildings. Dust will be a temporary impact associated with the construction phase of the project. Taking into consideration the distance of sensitive receptors to the site, impacts from increased dust are not likely to be significant.

No dust generation is expected to occur during the operational phase of the project, except for minimal dust created by maintenance vehicles along gravel roads, which is expected to be infrequent.

Appropriate measures to manage impacts associated with dust generation will be developed during the EIA phase of the project and identified in the draft EMPr, if necessary.

6.3.3 Loss of Agricultural Land

The Drennan site is currently zoned for agriculture (livestock grazing and cultivation). The construction activities and the establishment of the PV power facility will result in a reduction in the area of land that is available for livestock grazing (the cultivated areas will not be impacted), as the PV array area will be fenced off.

The potential impact of loss of agricultural land will be assessed in the EIR and appropriate mitigation measures will be included in the draft EMPr where necessary.

6.3.4 Loss of, or Damage to, Palaeontology, Archaeological or Cultural Heritage Resources

Section 38 of the National Heritage Resources Act states that any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
(c) any development or other activity which will change the character of a site -
(i) exceeding 5,000 m² in extent;

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Excavations required for the installation of PV arrays, road construction, laying of cables etc., as well as land clearing, could disturb or destroy features of cultural heritage value, if they exist in the area. These potential impacts will be assessed through a heritage specialist study in the EIA phase along with the required submissions to the South African Heritage Resource Agency (SAHRA).

6.3.5 Visual and Aesthetic Landscape Impacts

There are a number of existing man-made features including power lines, Eskom's Drennan Traction Substation, a railway line and roads in the local landscape. However, the proposed development will result in a significant change to the local landscape character. The development is likely to impact the overall sense of place of the wider area. The PV panels will cover up to 110 ha (1.1 km^2) in total and the PV arrays will be seen from visual receptors in the area. It should be noted that the height of the proposed infrastructure for the proposed PV power facility will be considerably lower than that of the existing infrastructure in the area, i.e. Eskom's Drennan Traction Substation, power lines and the railway infrastructure.

The EIA will consider the effects that the new PV power facility will have on the landscape character and effects upon potential viewers. The site is located in a rural area and is relatively flat and as such the visual impact of the PV power facility is regarded as a potentially important consequence of the proposed development.

A specialist landscape and visual impact assessment will be undertaken during the EIA phase to assess the visual impacts of the development and the identification of appropriate mitigation and management measures to be included in the draft EMPr, if necessary.

6.3.6 Impact on Flora, Fauna and Habitats

The development of the proposed PV power facility could result in impacts on flora and fauna due to disturbance, displacement or direct habitat loss. The disturbance associated with construction activities can also result in the introduction and rapid colonisation of alien (non-native) species. The following key potential impacts may result from the proposed development:

- Loss of habitat for floral and faunal species;
- Displacement of certain faunal species, temporarily or permanently from the establishment of the proposed development;
- Fragmentation of habitat and faunal populations through the presence of security boundary fencing around the development; and
- Loss of land within a Critical Biodiversity Area (CBA).

A botanical and ecological specialist study will be undertaken during the EIA phase to assess the impact on terrestrial flora and fauna and the identification of appropriate mitigation and management measures to be included in the draft EMPr.

6.3.7 Impact on Avifauna

The development of the proposed PV power facility could result in impact on avifauna due to disturbance, displacement or direct habitat loss. The following key potential impacts may result from the proposed development:

- Loss of habitat (foraging/nesting) for bird species; and
- Displacement of certain bird species, temporarily or permanently, due to the establishment of the proposed development.

These impacts and any other impacts identified during the EIA will be further investigated in the EIR. This investigation will be accompanied by the identification of appropriate mitigation and management measures during the EIA phase, which will be included in the draft EMPr.

6.3.8 Impact on Traffic during Construction

There may be a minor increase in traffic during the construction of the proposed PV power facility as a number of trucks will be required to transport infrastructure, equipment and construction materials onto site and earth-moving vehicles will be involved in construction activities.

Further information regarding traffic levels and an assessment of significance will be provided in the EIR.

6.3.9 Impacts Due to Waste Generation

Waste from the construction activities may arise from a range of sources, including the following:

- minimal excavated material (e.g. rock and soil);
- waste from construction workers living on and using the site; and
- waste from equipment, packaging, materials and vehicles.

Following the construction phase, there will be limited waste production during the operational phase. Specific requirements for waste management and disposal will be identified in the draft EMPr developed during the EIA phase of the project.

6.3.10 Soils, Geology, Hydrology and Erosion Potential

The potential effects on soils and geology from construction and decommissioning may include:

- the potential for soil properties at the site to be permanently altered due to site preparation (e.g. compaction of soil);
- the potential for the drainage lines across the site to be subject to flash floods; and
- site preparation and vegetation clearance activities which could cause instability and increased erosion potential.

These impacts can be easily mitigated or managed through the implementation of various measures such as avoiding placing infrastructure along or in dry drainage lines, for example. The project will require a water supply during construction and operation, and removal of vegetation and the development of access roads and hard standing surfaces (e.g. compacted temporary construction camp and service buildings) may impact surface water flow and run off within the site area and near surrounds, during both the construction and operational phases. In order to reduce the potential impacts to surface water flow it is proposed that the use of impermeable concrete hard standing areas should be avoided.

The potential impacts discussed above and any further impacts identified during the EIA will be further investigated in the EIR. These will be accompanied by the identification of appropriate mitigation and management measures, such as specific measures to manage surface water run-off, during the EIA phase and included in the draft EMPr.

6.3.11 Surface Water and Groundwater Contamination

The potential for surface water contamination is an important consideration in relation to the construction of the PV power facility. Soil erosion leading to increased sediment load in surface water runoff could impact on drainage channels in the local area. The potential for groundwater contamination is associated with uncontrolled spills of fuels and lubricants during the construction phase. Fuel storage on site will be limited to bunded areas. The extent and impact of potential groundwater or surface water contamination is largely dependent on the nature of the subsurface soil conditions, their transmissivity and susceptibility to erosion. Apart from the permeability of the soil substrate, groundwater contamination could also occur through joints, fractures and contact zones associated with the geology.

Basic precautions to prevent groundwater and surface water impact during construction will be identified in the draft EMPr developed during the EIA phase of the project.

6.3.12 Socio-Economic Impacts

Employment and procurement have been the issues of most interest to local stakeholders to date, and this is likely to continue. If managed well, it is the impact factor with the greatest potential to have a significant positive effect on the local area.

PV power facilities generate the largest employment levels per MW of electricity generated in comparison to other generation types. Employment opportunities will arise from the proposed development over the duration of the development, i.e. from the construction phase through to decommissioning. Solaire Direct have constructed, operated and maintained a number of PV power facilities in France, North Africa, India, as well as South America and based on these experiences it is considered that 110 to 120 full time workers will be required during construction of the 90 MW PV power facility. As the development will be phased, these numbers are likely to fluctuate depending of the size of the stage being built at the time. Those employed during construction will receive training in the renewable energy sector which is a currently emerging industry in South Africa. The skill sets learned will be valuable and transferable elsewhere. During the operational phase a number of these employees will continue employment at the plant for maintenance purposes. These aspects will be explored more fully during the EIA phase.

Impacts associated with the accommodation of construction workers during the construction phase and the option of housing them on or off the site will be assessed further in the EIA phase.

A specialist study will be undertaken in the EIA phase to assess the potential impacts of the project related to direct and indirect employment opportunities.

6.3.13 Human Health and Safety

As with any construction project, there is potential for impacts on human health and safety as a result of accidents and unplanned events that may occur during the construction of the PV power facility.

The risk of injury associated with the construction of the PV power facility will be mainly limited to the subcontractors (as the site will be secured to avoid public incursion into the active development area), but there remains some risk of injury to other site users (i.e. farm workers). Basic safety precautions and protective measures will be specified in the draft EMPr which, in turn, will be incorporated into subcontractor health and safety plans.

6.4 SCREENING OF IMPACTS

The preceding *Section 6.3* describes a number of potentially significant impacts associated with the proposed development. One of the purposes of Scoping is

to offer a preliminary, qualitative assessment of potential environmental and social impacts associated with the project, thereby ensuring that those impacts that are potentially significant are assessed in the EIA Phase. With respect to this, a preliminary, qualitative assessment of the following environmental and social impacts has been undertaken as part of the scoping phase (refer to *Section 6.3*):

- noise impacts;
- impacts due to dust;
- loss of agricultural land;
- loss to archaeological, palaeontology and cultural heritage;
- visual and landscape impacts;
- impact on flora, fauna and habitats;
- impact on avifauna;
- impact on traffic;
- impact of waste generation;
- impact on soils, geology, hydrology and erosion potential;
- impact on surface and groundwater;
- socio-economic impacts; and
- health and safety impacts.

In addition to the above mentioned impacts, a number of other potentially significant issues were identified during the scoping phase. These impacts, which require further investigation through specialist studies, are the following:

- loss to archaeological, palaeontology and cultural heritage;
- visual and landscape;
- loss of agricultural land;
- natural vegetation and ecology; and
- socio-economic implications.

In addition to this, noise, dust, traffic, waste generation, potential effects on hydrology, soils and geology, and health and safety impacts will also be addressed in the EIA to follow, and controlled through the implementation of standard environmental management measures that will be included in the draft EMPr.

6.5 CUMULATIVE EFFECTS

Due to a substantial increase in the number of EIAs for renewable energy developments (solar and other renewable technologies), it is important to follow a precautionary approach in accordance with NEMA to ensure that cumulative impacts are addressed or avoided. The following positive and negative significant cumulative impacts could result due to the development of a number of solar energy facilities in close proximity to each other:

- visual intrusion;
- changes in (loss of) agricultural land;
- change in sense of place and character of the area;
- an increase in employment opportunities;
- an increase in electricity generated;
- an increase in the significance of ecological impacts; and
- an increase in the significance of geological and hydrological impacts.

The cumulative impacts of the proposed PV power facility and other solar energy facilities will be qualitatively assessed in the EIR as will the potential in-combination effect of the proposed PV power facility and other types of developments in the area.

It should, however, be noted that not all the solar power facilities presently under consideration by various developers will become operational. It is anticipated that not all proposed developments will be granted the relevant permits by the DEA, as well as the National Energy Regulator of South Africa (NERSA) and Eskom, due to the following reasons:

- there are limitations to the capacity of the existing Eskom grid;
- not all applications will receive positive environmental authorisation;
- there are stringent requirements to be met by applicants;
- not all proposed solar power facilities will be economically viable;
- not all solar power facilities will be able to reduce negative environmental impacts to acceptable levels or able to mitigate adequately; and
- not all solar power facilities will be successful in securing financial support.

7 PLAN OF STUDY FOR EIA

7.1 INTRODUCTION

The Scoping Phase represents an initial step of the EIA process. A key outcome of scoping includes the preparation of a Plan of Study for a full EIA. The EIA will then be carried out prior to approval and Environmental Authorisation of the proposed project. This section describes the Plan of Study for EIA as contemplated in regulation 28(1)(n) of R543 and sets out how the EIA will be conducted.

According to Government Notice R543 and Amendment R1159, Section 28(1)(n), a plan of study, must include the following:

a. *'a description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialised processes, and the manner in which such tasks will be undertaken;*
b. *an indication of the stages at which the competent authority will be consulted;*
c. *a description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and*
d. *particulars of the public participation process that will be conducted during the environmental impact assessment process'…*

This chapter serves as the Plan of Study and sets out the following:

- overview of activities to complete the EIA process;
- specialists studies;
- interaction with authorities;
- public participation activities;
- proposed methodology for assessing impacts; and
- provisional schedule for the EIA process.

7.2 OVERVIEW OF EIA TASKS

Following on from the Scoping Phase, the remainder of the EIA process will include the Specialist Studies and an Integration and Assessment Phase. In parallel with these activities, the EIA team will continue to interact with the Authorities and implement the public participation process.

7.2.1 *Specialist Study Phase*

It is anticipated that all the specialist studies will be completed before the end of winter 2012. However, this timeframe is subject to the approval of this Scoping Report and Plan of Study for EIA by DEA.

7.2.2 Integration and Assessment Phase

The aim of this phase is to synthesise the findings of the specialist studies and any other relevant available information into a draft EIR (including a draft EMPr). Information will be presented in a clear and understandable report which is easy to comment on and will aid decision-making.

The draft EIR and EMPr will be published for an I&AP comment period. Registered I&APs will be notified of the release of the draft EIR. Copies of the full report will be made available at key locations and on the project website.

Comments received on the draft EIR and EMPr will be collated and the EIA project team will provide a response. Comments and responses will be documented in a Comments and Responses Report which will be appended to the final EIR and submitted to DEA for decision-making.

Registered I&APs will be notified of the outcome of the EIA process once a decision (positive or negative) has been issued by DEA. The statutory appeal period will then follow.

The Integration and Assessment phase is anticipated to commence in April – May 2013. The commencement of this phase is, however, subject to the approval of the final Scoping Report, including the Plan of Study for the EIA.

7.2.3 Interaction with Authorities

The DEA will be consulted once the Scoping Report is submitted for approval, to ensure that all the requirements for Scoping have been met.

Once the Integration and Assessment phase of the EIA is underway, the next key interaction with the DEA will be the submission of the final EIR and EMPr for authorisation. However, at the request of the DEA, the consultants would be willing to present the findings of the impact assessment and conduct a site visit, prior to decision-making.

The Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA), the provincial commenting authority, will be engaged for their comments on the draft EIR. Heritage Eastern Cape or SAHRA will be engaged for their comments on submissions by the Heritage Specialists and draft EIR.

7.2.4 Public Participation Activities

Public participation is an essential part of the EIA process. As such, a number of opportunities will exist for public involvement during the Integration and Assessment phase of the EIA. This will include the following:

- The draft EIR will be released for a 40-day public and authority review period.

- A notification letter will be sent to all registered I&APs on the project database. This letter will invite I&APs to comment on the draft EIR.

- I&APs will be notified of the Environmental Authorisation and the statutory appeal period through correspondence and via a newspaper advert.

7.3 *SPECIALIST STUDIES*

As discussed in *Section 6.3*, a number of potentially significant issues were identified during scoping. The following specialist studies will, therefore, be commissioned to further investigate these issues and any data gaps:

- archaeological, cultural heritage and palaeontology impact study;
- landscape and visual impact study;
- loss of agricultural land;
- vegetation and terrestrial ecology impact study; and
- socio-economic impact study.

During the Specialist Study phase, the appointed specialists will:

- gather relevant data to provide a description of the affected environment;

- assist the project team in assessing potential impacts (both negative impacts and benefits) according to a predefined assessment methodology (see *Section 7.4*); and

- suggest ways in which negative impacts could be mitigated and benefits enhanced.

Specialists who will be responsible for the specialist studies are identified in *Table 7.1*.

Table 7.1 Specialists

Specialist Study	Name and Organisation	Qualifications
Archaeological, Heritage and Palaeontology study	Tim Hart (ACO Associates *cc.*)	PhD Archaeology, University of Cape Town
Landscape and Visual	Steven Stead (VRM Africa)	BA Hons (Human Geography and Geographic Information Management Systems), University of Kwa-Zulu Natal
Botany and Terrestrial Ecology	Simon Todd	MSc, Cum Laude Conservation Biology University of Cape Town
Agriculture	Kurt Barichievy	MSc. (Hydrology) UKZN, Pietermaritzburg (2006 – 2009) Pr.Sci.Nat

Specialist Study	Name and Organisation	Qualifications
Socio-economic	Lindsey Bungartz	BSocSci (Hons) Environmental Management

The terms of reference for each of the specialist studies is included in *Table 7.2* below. The results of the specialist studies will be integrated into the EIR during the Integration and Assessment Phase.

Table 7.2 Terms of Reference for Specialist Studies

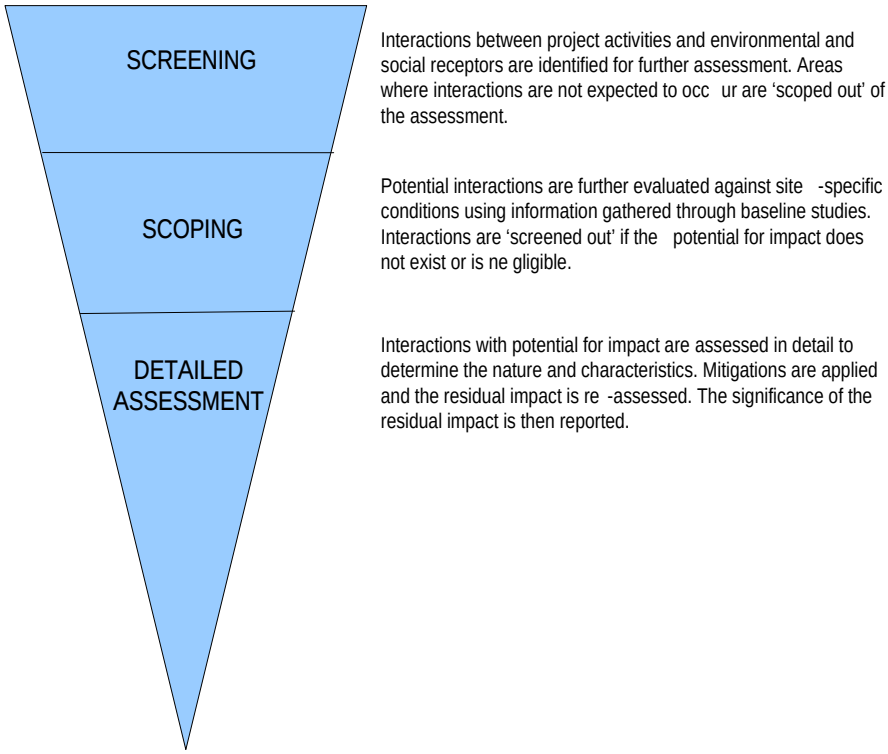
Specialist Study	Aim of the Study	Terms of Reference for specialist study
Archaeology, Cultural Heritage and Palaeontology	Determine the cultural heritage impacts associated with the PV power facility.	• Collect secondary data on the occurrence and distribution of heritage, archaeological and palaeontology sites in the study area. • Survey the project affected area and identify and describe sites of interest. • Explain how the different elements of the project may affect any archaeological, heritage and palaeontology sites within the study area. • Evaluate the potential impacts on sites of interest. • Describe mitigation/management measures that may be implemented to avoid or reduce any negative impacts on these sites and enhance benefits of the development. • Provide recommendations for any ongoing monitoring that may be necessary. • Liaison, submission and follow-up on all relevant permits, project applications and associated documents to the South African Heritage Resources Agency (SAHRA) and Heritage Eastern Cape as required.
Landscape and Visual	Assess the visual impact associated with the proposed development	• Collate all available spatial data for at least a 10 km radius around the study area. • Develop a 3D model of the study area using available aerial photos and contour data. • Use of visual assessment tools to create a view shed analysis of the proposed development. The increase in view area to be calculated and shown. • Identify farms/neighbouring properties affected by the new viewsheds. • Identify sensitive receptors in the viewsheds including towns. • Where necessary, determine of the visual absorption capacity by means of graphic representation (photomontages) of the proposed development on 2D photographs taken from key locations. • Describe relevant and implementable mitigation measures to reduce, avoid, or minimise negative impacts and enhance positive impacts and recommendations.

Specialist Study	Aim of the Study	Terms of Reference for specialist study
Vegetation and Terrestrial Ecology	Determine the impacts on vegetation and terrestrial ecology associated with the PV power facility.	• Undertake a desk and field-based investigation of the flora and fauna of the site (excluding avifauna), integrating on site information with available data from atlases, research reports and other published sources. • Map the ecological sensitivity of the site. • Assess the impacts on flora and fauna that are associated with the proposed development and describe relevant mitigation measures to reduce, avoid or minimise negative impacts to flora, fauna and habitats. • Provide recommendations for any ongoing monitoring that may be necessary.
Agriculture	Compile a detailed desktop agricultural potential assessment of the proposed area for development.	• Broadly assess the agricultural potential of the affected land by interrogating relevant climate, topographic, landuse and soil datasets. • Indicate, from an agricultural perspective, any potential fatal flaws which could result from the proposed activities. • Outline predicted impacts on agricultural resources, highlight problematic areas and specify 'no-go zones'.
Socio-economic	Assess the socio-economic impact associated with the proposed development	• Identify all relevant legislation, permits and standards that would apply to the development. • Provide a baseline description of the socio-economic environment that may be affected by the proposed project activities. • The baseline description will be derived from secondary data and primary data collection. • Identify and assess socio-economic impacts (direct, indirect and cumulative) that may result from the construction and operation phases of the project. • Recommend mitigation measures that address the local context and needs.

7.4 IMPACT ASSESSMENT METHODOLOGY

The following diagram (*Figure 7.1*) describes the impact identification and assessment process through scoping, screening and detailed impact assessment. The methodology for detailed impact assessment is outlined in *Section 7.4.1* below.

Figure 7.1 Impact Assessment Process



7.4.1 *Detailed Assessment Methodology*

The purpose of impact assessment and mitigation is to identify and evaluate the significance of potential impacts (positive or negative) on identified receptors and resources according to defined assessment criteria; to develop and describe measures that will be taken to avoid or minimise any potential adverse effects and enhance potential benefits; and to report the significance of the residual impacts that remain following mitigation. Essentially, the assessment of impacts is an iterative process that considers four questions:

- **Prediction** - what will happen to the environment as a consequence of the project?
- **Evaluation** - does this impact matter? How important or significant is it?
- **Mitigation** – if it is significant can anything be done about it to reduce the significance?

- **Residual Impact –** is it still significant?

Impact Types and Definitions

An impact is any change to a resource or receptor brought about by the presence of a project component or by the execution of a project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment.

Impacts are described as a number of types as summarised in *Table 7.3*. Impacts are also described as *associated*, those that will occur, and *potential,* those that may occur.

Table 7.3 Impact Nature and Type

Nature or Type	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect	Impacts that result from other activities that are encouraged to happen as a consequence of the project (e.g. in-migration for employment placing a demand on resources).
Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the project.

Significance

Impacts are described in terms of '*significance*'. Significance is a function of the **magnitude** of the impact and the **likelihood** of the impact occurring. Impact magnitude (sometimes termed *severity*) is a function of the **extent, duration and intensity** of the impact. The criteria used to determine significance are summarised in *Table 7.4*. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in *Table 7.5*. For ease of review, the significance rating is colour-coded in the text according to
Table 7.6. Outlined in
Table 7.7 are the various definitions for the significance of an impact.

Significance of an impact is qualified through a statement of the **degree of confidence**. Confidence in the prediction is a function of uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence is expressed as low, medium or high.

Table 7.4 Significance Criteria

Magnitude – the degree of change brought about in the environment	
Extent	**On-site –** impacts that are limited to the Site Area only. **Local –** impacts that affect an area in a radius of 20 km around the development area. **Regional –** impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystems. **National –** impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences. **Transboundary/International –** impacts that affect internationally important resources such as areas protected by international conventions.
Duration	**Temporary –** impacts are predicted to be of short duration and intermittent/occasional. **Short-term –** impacts that are predicted to last only for the duration of the construction period. **Long-term –** impacts that will continue for the life of the project, but ceases when the project stops operating. **Permanent –** impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the project lifetime.
Intensity (1)	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie habitats, species or communities).* **Negligible –** the impact on the environment is not detectable. **Low –** the impact affects the environment in such a way that natural functions and processes are not affected. **Medium –** where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High –** where natural functions or processes are altered to the extent that it will temporarily or permanently cease.
	SOCIO-ECONOMIC ENVIRONMENT: *Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the project.* **Negligible –** There is no perceptible change to people's way of life. **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High** - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.
Likelihood - the likelihood that an impact will occur	
Unlikely	The impact is unlikely to occur.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.

(1) The frequency of the activity causing the impact also has a bearing on the intensity of the impact, i.e. the more frequent the activity, the higher the intensity.

Table 7.5 Significance Rating Matrix

SIGNIFICANCE				
		LIKELIHOOD		
		Unlikely	**Likely**	**Definite**
MAGNITUDE	**Negligible**	Negligible	Negligible	Minor
	Low	Negligible	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

Table 7.6 Significance Colour Scale

Negative ratings	**Positive ratings**
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table 7.7 Significance Definitions

Significance definitions	
Negligible significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that medium impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the project.

Mitigation of Potential and Residual Impacts

For activities with significant impacts, the project would be required to identify suitable and practical mitigation measures and fully implement them. The implementation of the mitigation measures is ensured through the EMP. Once the mitigation is applied, each impact is re-evaluated, assuming that the mitigation measure is effectively applied, and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

7.5 PROJECT TIMING

Table 7.8 outlines the current estimated timeline of the assessment process going forward.

Table 7.8 Planned Schedule for Future Activities

Task	Date
Stakeholder Comment on Draft Scoping Report and Plan of Study for EIA	22 November – 20 January 2012
Finalise Scoping Report and Plan of Study for EIA and submit to DEA	End January 2012
Acceptance of Scoping Report received from DEA	Mid March 2012
Specialist studies	Mid March – April 2013
Prepare Draft EIR and EMP	April – May 2013
Stakeholder Comment on Draft EIR and EMP	May– June 2013
Finalise and submit EIR and EMP to DEA	July 2013

Upon completion of the public comment period (22 November to 20 January 2012), the Final Scoping Report will be submitted to DEA for approval. On acceptance of the Final Scoping Report by DEA, the EIA will proceed with the Impact Assessment Integration Phase.

I&APs will be notified of the availability of the Draft EIR for comment.

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