Annex A

Legislative Framework

CONTENTS

A1 LEGISLATIVE FRAMEWORK

A1.1 INTRODUCTION

This Annex provides a description of the institutional framework applied to the project, and the most relevant national and provincial legislation, policies and guidelines that have been taken into consideration. The content is as follows:

- Relevant South African government departments and regulators;
- South African law relevant to environmental and social standards deemed applicable to the project; and
- International conventions and standards to which South Africa is a signatory and with which the project must comply (relating to issues such as climate change and biodiversity).

A1.2 GOVERNMENT DEPARTMENTS AND REGULATORS

There are a number of Ministries and Departments that have an interest in and will take responsibility for ensuring that the proposed solar power plant project is implemented in an environmentally responsible manner. The concept of co-operative governance is becoming increasingly important in relation to the adjudication of Environmental Impact Assessment (EIAs) in South Africa and whenever an activity falls within the jurisdiction of more than one organ of state, there must be co-ordination and co-operation between those organs of state in the consideration of EIAs and decision-making.

A1.2.1 National

Department of Environmental Affairs (DEA)

The DEA falls under the Ministry of Water and Environmental Affairs and is responsible for all environmental affairs and decision making.

In terms of South Africa's Constitution, responsibility for the environment is shared between provincial and national government. Although decision-making on EIAs is, under most circumstances, a provincial competency, all renewable energy projects are being processed by the DEA, who is the national controlling authority based in Pretoria. This arrangement is set out in Section 4.1 of the 'Guideline in Environmental Impact Assessments for Facilities to be Included in the Electricity Response Plan', 25 November 2008, GN 162 of 2010. The DEA is, therefore, the competent authority for this proposed project and will be responsible for making a decision whether or not to authorise the project.

Department of Water Affairs (DWA)

The DWA falls within the Ministry of Water and Environmental Affairs and is the custodian of South Africa's water resources. While striving to ensure that all South Africans gain access to clean water and safe sanitation, the department also promotes effective and efficient water resources management to ensure sustainable economic and social development.

Unlike the DEA which has separate government departments in each province, DWA has regional offices in different areas. Should registration or a Water Use License be required for the proposed project (see discussion in *Section A1.3.3* below) application would be made to the regional offices of the DWA in Cape Town.

Department of Energy (formerly the DME)

The Department of Energy is responsible for policy relating to all forms of energy generation, including renewable energy. The Department commissioned an Integrated Energy Plan (IEP) in response to the requirements of the National Energy Policy in order to provide a framework by which specific energy policies, development decisions and energy supply trade-offs could be made on a project-by-project basis. The framework is intended to create a balance between energy demand and resource availability so as to provide low cost electricity for social and economic development, while taking into account health, safety and environmental parameters. Solar Energy is specifically considered in the White Paper for Renewable Energy, 2002.

National Energy Regulator of South Africa (NERSA)

NERSA is a regulatory authority established in terms of the National Energy Regulator Act, 2004 (Act No. 40 of 2004). Its role, among others, is to regulate the electricity industry in terms of the Electricity Regulation Act (Act 4 of 2006). This body will ultimately be the licensing authority for electricity generation from solar farm developments.

South African Heritage Resources Agency (SAHRA)

SAHRA is the national body responsible for policy development for heritage resources management. They are the controlling authority in terms of the National Heritage Resources Act (Act 25 of 1999). SAHRA administers heritage in the province particularly where archaeology and palaeontology are the dominant concerns. The Eastern Cape Provincial Heritage Resources Authority (ECPHRA) deals largely with built environment issues at this stage. Archaeology, including rock art, graves of victims of conflict and other graves not in formal cemeteries are administered by the national heritage authority, SAHRA.

Department of Transport

The Department of Transport is responsible for regulation of Transportation in South Africa, including, public transport, rail transportation, civil aviation, shipping, freight and motor vehicles.

The South African National Roads Agency SOC Limited, generally known as SANRAL, is an independent, statutory company registered in terms of the Companies Act. The South African government, represented by the Minister of Transport, is the sole shareholder and owner of SANRAL. SANRAL is responsible for the management and maintenance of the national road network of South Africa.

SANRAL are included on the stakeholder database and will be contacted for comment on this project as it is located adjacent to a national road.

A1.2.2 Provincial

Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT)

DEDEAT is the provincial department responsible for economic development and environmental affairs in the Eastern Cape.

DEDEAT's mission is 'to provide strategic leadership in developing a people-centred, equitably shared, green economy through effective programmes, strategic partnerships and responsive services.' With regard to the EIA for the Genoegsaam PV Power Facility project, DEDEA are regarded as an important commenting authority and will provide comment on the EIA and input to the national Department's decision-making process.

Eastern Cape Provincial Heritage Resource Authority

In terms of Section 28(8) of the Heritage Resources Act (Act 25 of 1999) and Regulation 3(3)(a) of PN 298 (29 August 2003) (as discussed below) an application will be made to SAHRA regarding the proposed project. ECPHRA will provide comment on the proposed project.

Other

- Eastern Cape Department of Transport
- Eastern Cape Department of Agriculture and Land Affairs.

A1.2.3 Municipal

Certain Departments, such as the Planning and Roads Departments, from the Chris Hani District Municipality will also be involved as a commenting authority for the EIA. External to the EIA but also relevant to the project are land-use planning applications which are dealt with by the planning departments at a local government level

A1.3 LEGISLATIVE AND POLICY REQUIREMENTS

The proposed activity is subject to legislative and policy requirements at a national and provincial level. The most important of these are listed below.

National:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended;
- NEMA EIA Regulations (2010);

- National Water Act (Act No. 36 of 1998);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- National Environmental Management: Protected Area Act (Act No. 57 of 2003);
- National Forest Act (Act No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999);
- Electricity Regulation Act (Act No. 4 of 2006) as amended;
- Occupational Health and Safety Act (Act No. 85 of 1993);
- Subdivision of Agricultural Land Act (Act No. 70 of 1970);
- Department of Environmental Affairs and Tourism (DEAT) Integrated Environmental Management Information Series No.2, Scoping, 2002;
- Noise Control Regulations, Environment Conservation Act (Act No. 73 of 1989) and SANS Code 10328, Methods for Environmental Noise Impact Assessments in Terms of NEMA; and
- Conservation of Agricultural Resources Act (Act 43 of 1983).

Provincial – Eastern Cape:

- Eastern Cape Parks and Tourism Agency Act (Act No. 2 of 2010); and
- Eastern Cape Nature Conservation Act, 19 of 1974 and variously amended thereafter.

A brief description of the requirements in the above listed Acts and Regulations is provided below.

A1.3.1 National Environmental Management Act (Act 107 of 1998)

Section 24 of the National Environmental Management Act (NEMA) as amended gives effect to the South African Constitution, which states that all South African citizens have a right to an environment that is not harmful to their health or well being.

Key principles of NEMA are described in **Chapter 1** of the Act and include the following:

- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated;
- Decisions concerning the environment must take into account the needs, interests and values of all I&APs;
- Community well-being and empowerment must be promoted through environmental education and awareness, and the sharing of knowledge and experience;
- Decisions must be taken in an open and transparent manner; and
- Access to information must be provided in accordance with law.

Chapter 5 of NEMA deals with Integrated Environmental Management and focuses on promoting the use of appropriate environmental tools, such as Environmental Impact Assessment. Section 24 requires that activities be investigated that may have a potential impact on the environment, socio-economic conditions, and cultural heritage. The results of such investigations must be reported to the relevant authority. Procedures for the investigation and communication of the potential impact of activities are contained in Section 24 (4) of the Act, which requires that:

- The potential impact, including the cumulative effects of the activity and its alternatives must be investigated;
- The significance of the potential impact must be assessed;
- Mitigation measures which minimise adverse environmental impacts must be investigated;
- The option of not implementing the activity must be considered;
- There must be public participation, independent review and conflict resolution in all phases of the investigation and assessment of impacts; and
- Where an activity falls within the jurisdiction of more than one organ of state, there must be co-ordination and co-operation between those organs of state in the consideration of assessments.

Chapters 1 and 5 of NEMA provide a basis for consideration of potential impacts associated with a proposed development, by the competent authority.

These chapters provide the framework legislation for the more detailed EIA regulations (see *Section A1.3.2* below). These regulations form the basis of ERM's approach to the EIA.

Section 28 of the Act is specific regarding "duty of care" for the environment and remediation of environmental damage. Accordingly, every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring. The Act defines pollution broadly as any change in the environment caused by substances, radioactive or other waves, or emissions of noise, odours, dust or heat.

The environmental authorities may direct an individual or organisation to rectify or remedy a potential or actual pollution problem. If such a directive is

not complied with, the authorities may undertake the work and recover the costs from the responsible party.

Section 28 would be relevant to the construction and operational phase of the proposed development. The proponent is obligated, in terms of NEMA, to implement measures and take actions to prevent any form of pollution to air, water or land.

A1.3.2 NEMA EIA Regulations

On 18 June 2010 revised EIA Regulations (Government Notice No R. 543, 544, 545 and 546) were promulgated in terms of Section 24(5) of NEMA. These regulations came into effect on 1 August 2010, replacing the regulations of 21 April 2006. A description of these regulations is provided below.

The Minister of Water and Environmental Affairs has in terms of Sections 24(2)(a) and (d) of NEMA, listed the activities which may have a detrimental effect on the environment in Government Notices GN544, 545 and 546. The regulations require that written authorisation is obtained from the Minister or his delegated authority, in this case the national Department of Environmental Affairs (DEA), in respect of which the investigation, assessment and communication of potential impacts of these activities must follow the procedure as described in Regulations 26 to 35 of the EIA Regulations. Such authorisation, which may be granted subject to conditions, will only be considered once the regulatory requirements have been met. Government Notice R543 sets out the procedures that need to be complied with.
The activities that would be relevant to the proposed project are listed in the Environmental Impact Assessment (EIA) Regulations. Activities from listings GN544, GN545 and GN546 would be relevant. GN544 activities require a Basic Assessment process and GN545 activities require a more comprehensive Scoping and EIA process. Given the applicability of activities from all three listings, a Scoping and EIA process is being undertaken.
The EIA Regulations, June 2010 (Government Notice R544 and R545) 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 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.

A1.3.3 National Water Act (Act 36 of 1998)

The National Water Act (NWA) is the primary legislative instrument for the control and management of South Africa's water resources. In addition to ensuring equitable access to and use of water, a key function of the NWA is to ensure the protection of a national water resource from pollution. Many provisions in the NWA are similar to those in NEMA, but refer specifically to pollution of a water resource, whereas NEMA refers to any change in an environment (land, water, air). The definition of "water resource" includes surface water bodies, groundwater and aquifers.

Section 19 of the Act deals with the prevention and remediation of pollution. It is the responsibility of an owner of land, a person in control of land or a person who occupies or uses that land to take all reasonable measures to prevent pollution of a water resource from occurring, continuing or recurring. If these measures are not taken the authorities may do whatever is necessary

to prevent the pollution or remedy its effects and may recover all reasonable costs. This Section includes pollution that may arise from contaminated stormwater.

Section 20 deals with the control of emergency incidents. In this Section, "incident" includes any incident or accident in which a substance –

- pollutes or has the potential to pollute a water resource; or
- has, or is likely to have, a detrimental effect on a water resource.

The onus is therefore on Solaire Direct to ensure that storm water runoff is not contaminated, particularly during the construction phase.

The Act requires a person to obtain a Water Licence for 'water use', which in terms of Section 21 includes the following activities which may be relevant to the proposed project:

- taking water from a water resource;
- storing water;
- impeding or diverting the flow of water in a watercourse;
- disposing of waste in a manner which may detrimentally impact on a water resource; and
- altering the bed, banks, course or characteristics of a watercourse.

Generally a water use must be licensed unless it is listed in Schedule I of the Act, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. Section 39 of the Act allows the Minister to issue General Authorisations for certain activities which then do not require a water use licence. General Authorisation GNR 398, 26 March 2004, gives the landowner / occupier / lawful user permission to alter the bed, banks or characteristics of a water course (including for roads) without the requirement for a Water Use License, as long as the following conditions are met:

- The alteration:
    - does not impact on a water resource or on another person's water use, property or land; and
    - is not detrimental to the health and safety of the public in the vicinity of the activity
- The natural migration patterns of aquatic biota and the sustainable ecological functioning of the system are not interfered with;
- The alteration activity does not extend for more than 50 metres continuously or a cumulative distance of 100 metres on that property or land, measured along the watercourse;
- The volume of flow is not reduced except for natural evaporative losses;
- Strict erosion control measures are to be taken during and after construction to ensure no erosion of the bed and banks of the river takes place;
- The water quality is not detrimentally affected; and

- All necessary measures are taken to stabilize the structure and surrounding area. This will include:-
    - rehabilitation of the riparian habitat integrity by ensuring that during rehabilitation only indigenous shrubs and grasses are used in restoring the bio-diversity;
    - rehabilitation of disturbed and degraded riparian areas to restore and upgrade the riparian habitat integrity to sustain a bio-diverse riparian ecosystem;
    - removal of alien vegetation and all new alien vegetation recruitment must be controlled; and
    - annual habitat assessment must be carried out to monitor the sustainability of the diversion and compliance with the above conditions. Action must be taken to rectify any impacts
- Any structure built fully or partially in or across a watercourse does not exceed-
    - a height of 10 metres, measured from the natural level of the bed of the watercourse on the downstream face of the structure to the crest of the structure;
    - a width of 10 metres, measured at the widest part of the structure; or
    - a length of 50 metres, measured from one edge of the watercourse to the other; or
    - occur within a distance of 500 meters upstream or downstream of another structure that alters the bed, banks or characteristics of the same watercourse, measured along the watercourse.

Solaire Direct must ensure that any potential water crossings meet the above requirements or alternatively a Water Use License may be required. Based on current information and understanding of the projects, the river crossings would meet these conditions. Section 2.8 (1) of the General Authorisation states that a person who uses water in terms of this authorisation must submit a registration form for the registration of the water use if the alteration involves mining related activities or occurs within a distance of 1 000 meters from any other alteration, measured along the watercourse.

A1.3.4 The National Environmental Management: Waste Act (59 of 2008)

The National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA) is the major piece of legislation governing waste management in South Africa and is relevant to all aspects of both hazardous and non-hazardous waste management.

It aims to regulate waste management in order to protect human health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development. In this regard, it provides for the following issues related to waste management:

- Institutional arrangements and planning matters;

- National norms and standards for regulating the management of waste;
- Specific waste management measures;
- Licensing and control of waste management activities;
- The remediation of contaminated land;
- A national waste information system; and
- The issue of compliance and enforcement.

Relevant definitions are detailed in *Table1.1* and the sections of the Act relevant to the project are outlined below.

Table 1.1 Relevant definitions include the following

Term	Definition
Contaminated	The presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely.
Holder of waste	Means any person who imports, generates, stores, accumulates, transports, processes, treats, or exports waste or disposes of waste
Pollution	Any change in the environment caused by – (i) substances; (ii) radioactive or other waves; or (iii) noise, odours, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

General duties of holders of waste

Section 16 of the Act sets out the general duties with respect to environmentally sound waste management, which any 'holder of waste' is obliged to adhere to. This requires taking all reasonable measures to:

- avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;
- reduce, re-use, recycle and recover waste;
- ensure that the waste is treated and disposed of in an environmentally sound manner, only when it cannot be disposed of;
- manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
- prevent any employee or any person under his or her supervision from contravening this Act; and
- prevent the waste from being used for an unauthorised purpose.

Reduction, re-use, recycling and recovery of waste

Section 17 of the Act requires any person involved in the reduction, re-use, recycling and recovery of waste to undertake such activities using less natural resources and in such a way as to cause less environmental harm than would be the case if the same waste were to be disposed of.

Remediation of Contaminated Sites

Prior to the promulgation of NEMWA, remediation of contaminated land was primarily regulated in terms of Section 28 of NEMA and the National Water Act, 1998 (NWA). This relates to the Duty of Care provision contained within NEMA and Section 19 of NWA, which relates to prevention and remedying the effects of pollution. Part 8 of the Waste Act builds on this existing legislation by providing a more coherent administrative framework and set of procedures, which are intended to be retroactively active.

Although Part 8 of the Act is not yet in effect, owing to the lack of norms and standards to make these provisions effective, this section may have implications for the project in the future. Accordingly, the specific steps related to the associated remediation process are discussed in further detail below. Box 5.1 (below) also provides additional information on the current status of Part 8, namely the 'contaminated land' section of NEMWA.

Section 36 (5) of the Act states that "an owner of land that is significantly contaminated, or a person who undertakes an activity that caused the land to be significantly contaminated, must notify the Minister and MEC of that contamination as soon as that person becomes aware of the contamination."

This effectively means that all contaminated sites will, once the section comes into effect, have to be reported to government, even if the contamination took place before this Act was promulgated. It also means that a land owner can independently notify the Minister if contamination is detected.

Section 37 details aspects that should be considered in a site assessment report, for example:

- The type of contaminants and their related toxicity and mobility;
- Exposure pathways that may be present;
- The surrounding land use and the likelihood of contaminants migrating off site; and
- What measures are to be taken to manage or neutralise the risk associated with contaminants.

Furthermore, Section 37 states that land will be regarded as contaminated – even if the risk is currently acceptable – when there is a possibility of a future land change that will cause a different risk scenario.

Section 38 deals with the review and decision of the Minister or MEC in conjunction with the (former) Department of Water Affairs and Forestry, based on the site assessment report. There are four possible decisions:

- Land is contaminated and presents a risk to health or the environment and urgent remediation is required;

- Land is contaminated and presents a risk to health or the environment and remediation over a specified period is required;
- Land is contaminated and does not present an immediate risk to health or the environment and monitoring is required to address the risk; or
- Land is not contaminated.

Once the Minister or MEC has declared affected land a remediation site, a Remediation Order will be issued to neutralise the risk. The cost for remediation falls upon the person against whom the order is issued. A Remediation Order may be amended if ownership of the site is transferred and the new owner in writing assumes responsibility for the remediation.

Section 39 deals with Remediation Orders. Noteworthy in this section is that the order must specify the timeframe in which remediation needs to take place and that there could be restrictions on land use. Predicting remediation timeframes can be difficult and site assessment reports and pilot studies will have to be done thoroughly so as to present realistic timeframes. Orders can be amended if new information comes to light.

Section 40 states that no contaminated site can be transferred without making it known to the new owner. If the site is a remediation site, the Minister or MEC needs to be notified as well.

Section 41 makes provision for a national Contaminated Site Register that is kept by the Minister. This register has to contain all details about contaminated sites as well as the progress of remedial activities. Sites may be taken off the register when remediation orders have been complied with.

Box 1.1 below describes the current status of Part 8.

Box 1.1 Current Status of the 'contaminated land' Section of the Waste Act

Given the implications of Sections 36 – 41, it is not surprising that these provisions have been withheld from the version of the Act that came into effect in July 2009. The main reason purportedly for the exclusion of these sections is the lack of norms and standards which are necessary to make the provisions effective.

The "Framework for the Management of Contaminated Land" guidance document was published by the Department of Environmental Affair in May 2010. This document defines soil screening values for a number of chemical compounds for preliminary assessment of contaminated land and it describes the phased process by which contaminated land should be assessed. Of note is that the Framework recognises that site specific quantitative risk assessment (QRA) is international best practice and provides guidance for the use of QRA to assess contaminated land.

Although the soil screening values provide norms and standards to support enactment of Sections 36-41, this has not yet happened.

The process of finalising the norms and standards to bring part 8 of the new Waste Act into effect is currently underway and should be completed towards the end of this year (2011). The existing Sections 36 – 41, as described above, will not change. They will come into effect by a proclamation of a Government Gazette Notice as soon as they can be supported by the norms and standards.

The Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (1998) and the Hazardous Substances Act (Act 15 of 1973) are also included in this section as they have some relevance to waste management. These are described in more detail in *Table 1.2* below.

Table 1.2 Other pieces of legislation related to Hazardous substances

Legislation	Requirement
Hazardous Substances Act (Act 15 of 1973)	**Control of Hazardous Substances** The Act regulates the control of hazardous substances and electronic products according to SANS 10228. Hazardous substances are those substances which cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature. Hazardous substances and products are classified according to the level of risk posed: - Group I and II: toxic substance that may be found on a hazardous landfill -Group III :electronic products -Group IV: radioactive substances, which may not be disposed -of on a landfill. The Act requires generators of waste to: Obtain license for the manufacture, modification, transport, storage, dumping or disposal of substances listed under the four groups of hazardous substances. Ensure that waste is transported and disposed of by an approved contractor at a licensed disposal site. Obtain and keep waste manifests and safe disposal certificates. Non-compliance may result in the imposition of a fine and / or imprisonment. Contravention of the provisions of the Act are an offence, and penalties range from the imposition of a fine to a sentence of up to ten years in jail.
Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (1998)	**Hazardous Waste Handling, Classification and Disposal** The Minimum Requirements is a guideline document providing the applicable waste management standards and specifications which must be met unless there is a valid motivation to the contrary. The Minimum Requirements document includes detailed requirements for the identification and classification, disposal, transportation, handling and storage of hazardous waste.

A1.3.5 National Environmental Management: Biodiversity Act (Act 10 of 2004)

Amongst other objectives, the Biodiversity Act seeks to provide for the management and conservation of biological diversity and its components, the sustainable use of indigenous biological resources, and the fair and equitable sharing of benefits arising from bio-prospecting of indigenous biological resources. It further seeks to provide for co-operative governance in biodiversity management and conservation.

Chapter 1 provides that the Act give effect to conventions affecting biodiversity to which South Africa is a party. These would include the United Nations Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), the Ramsar Convention and the Bonn Convention.

Significantly, the Act provides for the protection of ecosystems and species that are threatened or in need of protection and seeks to prevent the introduction and spread of alien or invasive species. As such, it controls and regulates:

- certain threatening activities occurring in identified ecosystems;
- certain activities which may negatively impact on the survival of identified threatened or protected species; and
- certain restricted activities involving alien or listed invasive species.

One of the activities listed in terms of this Act requires that any TOPS species need to be relocated the relevant permits will need to be obtained.

In accordance with the Biodiversity Act, an important function of the EIA and associated specialist studies is to ensure that sensitive vegetation is not detrimentally affected by the installation and construction activities associated with the establishment of the renewable energy facility and its associated infrastructure.

A1.3.6 National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".*

No protected tree species were observed in the vicinity of the site and as the site is quite small and the landscape open, it is relatively safe to conclude that no protected tree species occur within the study area.

A1.3.7 National Heritage Resources Act (Act 25 of 1999)

The protection and management of South Africa's heritage resources is controlled by the National Heritage Resources Act (NHRA), 1999 (Act No. 25 of 1999). The objective of the NHRA is to introduce an integrated system for the management of national heritage resources.

Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act (SAHRA), palaeontological heritage impact assessments (PIAs) and archaeological impact assessments (AIAs) are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is know to have

occurred during prehistory and the historic period. Depending on the sensitivity of the fossil and archaeological heritage, and the scale of the development concerned, the palaeontological, and archaeological impact assessment required may take the form of (a) a stand-alone desktop study, or (b) a field scoping plus desktop study leading to a consolidated report. In some cases these studies may recommend further palaeontological and archaeological mitigation, usually at the construction phase. These recommendations would normally be endorsed by the responsible heritage management authority, to whom the reports are submitted for review.

As part of the EIA, a Heritage Impact Assessment (including both archaeology and palaeontology) will be submitted to Eastern Cape Provincial Heritage Resources Authority (ECPHRA) and SAHRA to elicit comments. Comments received will be included in the Comments and Responses Report in *Annex C*.

Table 1.1 outlines when a permit is required depending on the sensitivity of the heritage resources.

Table 1.3 Permitting requirements for fossil, built environment and Stone Age archaeology

PERMIT APPLICATION SECTION 35 – FOSSILS, BUILT ENVIRONMENT FEATURES, SHIPWRECKS & STONE AGE ARCHAEOLOGY (Ref : NHRA 1999: 58):
(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite; (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite.

Burial Grounds and Graves

A Section 36 permit application is made to the South African Heritage Resources Agency (SAHRA) which protects burial grounds and graves that are older than 60 years, and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the conditions listed in *Table 1.2*.

Table 1.4 Permitting requirements for burial grounds and graves older than 60 years to ECPHRA and historic burials to the South African Heritage Resources Agency (SAHRA)

PERMIT APPLICATION SECTION 36 – BURIAL GROUNDS & GRAVES (REF: NHRA 1999 : 60)
(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves

PERMIT APPLICATION SECTION 36 – BURIAL GROUNDS & GRAVES (REF: NHRA 1999 : 60)
(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals (d) SAHRA or a provincial heritage resources authority may not issue a permit for The destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant

Table 1.5 Permitting requirements for heritage resources management

PERMIT APPLICATION SECTION 38 (Ref: NHRA 1999 : 62)
(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length; (b) the construction of a bridge or similar structure exceeding 50 m in length; (c) any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; (d) the re-zoning of a site exceeding 10 000 m^2 in extent; or (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

A1.3.8 Electricity Regulation Act and Regulations (Act 4 of 2006) as amended

The aims of the Electricity Regulation Act is to achieve efficient, effective and sustainable electricity supply, development and operation to ensure the needs of electricity users in South Africa are met and their interests safeguarded. This will be achieved through the facilitation of investment in the supply industry, access to electricity, promotion of use of diverse energy sources, promotion of competitiveness and a fair balance between the players in the industry and end users.

The Electricity Regulations on New Generation Capacity Government Notice R721 (August 2009), provides for the establishment and regulation of power purchase agreements with independent power producers (IPPs), guidelines governing the Renewable Energy Independent Power Procurement Programme (IPP Procurement Programme).

The proposed solar plant facility will provide an additional electricity supply through renewable energy sources. Solaire Direct, as the IPP, will be required to comply with guidelines governing the bid programme.

A1.3.9 *Electricity Regulation on New Generation Capacity (Government Gazette No 32378 of 5 August 2009)*

The Electricity Regulations on New Generation Capacity (Government Gazette No 32378) were promulgated on 5 August 2009 by the Department of Energy in terms of the Electricity Regulation Act 2006 (see *Section A1.3.7*), and are applicable to:- (a) all types of generation technology including renewable generation and co-generation technology (i.e. landfill gas, small hydro (less than 10 MW), wind and concentrated solar power (with storage)) but excluding nuclear power generation technology; (b) base load, mid-merit and peak generation; and (c) take effect from the date of promulgation, unless otherwise indicated. The objectives of these regulations are:

- The regulation of entry by a buyer and an Independent Power Producer (IPP) into a power purchase agreement;
- The facilitation of fair treatment and the non-discrimination between IPP generators and the buyer;
- The facilitation of the full recovery by the buyer of all costs incurred by it under or in connection with the power purchase agreement and an appropriate return based on the risks assumed by the buyer there under and, for this purpose to ensure the transparency and cost reflectivity in the determination of electricity tariffs;
- The establishment of rules and guidelines that are applicable in the undertaking of an IPP bid programme and the procurement of an IPP for purposes of new generation capacity;
- The provision of a framework for the reimbursement by the regulator, of costs incurred by the buyer and the system operator in the power purchase agreement; and
- The regulation of the framework of approving the IPP bid programme, the procurement process, the Renewable Feed in Tariff (REFIT) programme (now the Renewable Energy Independent Power Procurement Programme (IPP Procurement Programme)), and the relevant agreements to be concluded.

The guidelines describe the basic structure of the procurement programme, including the roles of various parties in the programme, namely the National Energy Regulator of South Africa (NERSA), Eskom and renewable energy generators. They specify that Eskom's "Single Buyer Office" is to be appointed as the Renewable Energy Purchasing Agency (REPA), the exclusive buyer of power under the procurement programme. Power generators participating in the procurement scheme are required to sell power generated by renewable technologies to Eskom (the REPA) under a Power Purchase Agreement (PPA). The Department of Energy (DoE) is tasked with the administration of the procurement programme.

In order to establish the proposed Genoegsaam PV power facility Solaire Direct, as an independent power producer, will need to enter into a Power Purchase Agreement (PPA) with NERSA in order to sell the electricity generated.

A1.3.10 Occupational Health and Safety Act (Act 85 of 1993)

The purpose of the OHSA (Act 85 of 1993) is to provide for the health and safety of persons at work or in connection with the use of equipment and machinery. It also provides for the protection of people other than employees from hazards arising from or in connection with activities of persons at work. In this regard an employer is required to bring about and maintain, as far as reasonably practicable, a work environment that is safe and without risk to the health and well-being of workers. The Act is administered by the Department of Labour who have established provincial offices. Occupational health and safety inspectors from these provincial offices undertake inspections and investigations at workplaces to ensure compliance with OHSA.

The Act covers *inter alia*:

- General duties of employers to their employees;
- Electing of Health and Safety Representatives and establishment of Health and Safety Committees; and
- Reporting and investigation of incidents.

Health and safety aspects of the project, as well as employment and labour relations within the construction, operation and decommissioning phases of the project, will need to be undertaken in accordance with OHSA.

A1.3.11 Conservation of Agricultural Resources Act (Act 43 of 1983)

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

Although several listed invasive species were observed at the site, the abundance and density of alien plants at the site was low. Alien species were largely associated with disturbed areas such as around watering points, and were not commonly observed in the veld.

Alien species observed at the site include *Opuntia imbricata*, *Malva parviflora*, *Conyza bonariensis*, *Datura stramonium* and *Tagetes minuta*. Several of these species are listed under category 1 and should be controlled as part of the EMP for the development.

In terms of this Act any agricultural chemicals (such as herbicides, pesticides and fertilizers) must be registered if they are to be used.

A1.3.12 Subdivision of Agricultural Land Act (Act No. 70 of 1970)

Solaire Direct will apply for an exemption (or departure) from applying for the subdivision of agricultural land in terms of the Subdivision of Agricultural Land Act (Act No. 70 of 1970) since agricultural activities will continue during operation of the facility.

A1.3.13 Integrated Environmental Management Information Series

The Department of Environmental Affairs and Tourism (DEAT) Information Series of 2002 consists of 20 documents. The documents were drafted as sources of information on the concepts and approaches to Integrated Environmental Management (IEM). IEM is a key instrument of NEMA and provides the overarching framework for the integration of environmental assessment and management principles into environmental decision-making. The aim of the information series is to provide general information on techniques, tools and processes for environmental assessment and management. ERM have referred to these various documents for information on the most suitable approach to the environmental assessment process for the proposed development.

The Information series on assessing impacts is particularly relevant to the EIR. This document outlines the approaches to and the objectives of assessing impacts.

A1.3.14 Eastern Cape Nature Conservation Act, 19 of 1974 and variously amended thereafter

The above act as well as the Transkei Decree (No 9 Of 1992) and the Ciskei Nature Conservation Act of 1987 are all applicable to the Eastern Cape. These acts make provision for the management of protected areas, as well as for regulations relating to the hunting of wild animals, catching of fish and the harvesting of plant species. Lists of protected plant and animal species are provided. Protected species include all frogs, tortoises and reptiles. The removal or destruction of any endangered or protected species requires a permit from the relevant authority.

A1.3.15 Municipal Bylaws

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 the Chris Hani District Municipality Integrated Development Plans (IDPs).

A1.3.16 International Guidelines

- IFC Performance Standards;

- Equator Principles; and
- Clean Development Mechanism (CDM).

The IFC applies Performance Standards (PS) to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing. The PS may also be applied by other financial institutions electing to apply them to projects in emerging markets. Together, the following eight PS establish standards that the client is to meet throughout the life of an investment by IFC or other relevant financial institution:

- PS 1: Social and Environmental Assessment and Management System;
- PS 2: Labor and Working Conditions;
- PS 3: Pollution Prevention and Abatement;
- PS 4: Community Health, Safety and Security;
- PS 5: Land Acquisition and Involuntary Resettlement (n/a);
- PS 6: Biodiversity Conservation and Sustainable Natural Resource Management;
- PS 7: Indigenous Peoples (n/a);
- PS 8: Cultural Heritage.

PS 1 establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of social and environmental performance throughout the life of the project. PS 2 through 8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, PS 2 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the client is required to manage them through its Social and Environmental Management System consistent with PS 1.

The Equator Principles (EPs) similarly are a credit risk management framework for determining, assessing and managing environmental and social risk in project finance transactions. Project finance is often used to fund the development and construction of major infrastructure and industrial projects. The EPs are adopted voluntarily by financial institutions and are applied where total project capital costs exceed US$10 million. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs, based on the IFC's Performance Standards on social and environmental sustainability and on the World Bank Group Environmental Health and Safety Guidelines (EHS Guidelines), are intended to serve as a common baseline and framework for the implementation by each adopting

institution of its own internal social and environmental policies, procedures and standards related to its project financing activities.

The relevant sections of the World Bank General Environment, Health and Safety Guidelines, as well as the industry specific Guideline on Solar Energy would also be applicable.

This EIA has been undertaken in accordance with the requirements of the EP and IFC Performance Standards. The EIA of course is only one step in the process of complying with the EP and IFC Performance standards and also would require the developer to keep to commitments made during the EIA process and to build on this by also meeting its commitments towards pre-construction and post construction monitoring, the conditions of approval that the DEA may impose, the EMP and an ongoing commitment towards environmental best practice. It is therefore recommended that the developer also commit to establishing and Environmental Management System against which the developer's ongoing performance can be monitored.

A1.4 INTERNATIONAL CONVENTIONS

A1.4.1 United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC is a framework convention which was adopted at the 1992 Rio Earth Summit. South Africa signed the UNFCCC in 1993 and ratified it in August 1997. The stated purpose of the UNFCCC is to, "*achieve….stabilisation of greenhouse gas concentrations in the atmosphere at concentrations at a level that would prevent dangerous anthropogenic interference with the climate system*", and to prevent human-induced climate change by reducing the production of greenhouse gases which are defined as, "*those gaseous constituents of the atmosphere both natural and anthropogenic, that absorb and re-emit infrared radiation*" (1).

The proposed solar farm project will contribute to a reduction in South Africa's greenhouse gases as it will provide an alternative to fossil-fuel based power generation.

A1.4.2 Kyoto Protocol

The Kyoto Protocol is a protocol to the UNFCCC which was initially adopted in 1997 in Kyoto, Japan, and which entered into force on 16 February 2005 (2) . The Kyoto Protocol is the chief instrument for tackling climate change. The main feature of the Protocol is that, *"it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions".* These amount to an average of five per cent against 1990 levels, over the five-year period 2008-2011. The major distinction between the Protocol and the Convention is that, "*while the Convention encouraged*

(1) UNFCCC website, 2010.
(2) *Ibid.*

industrialised countries to stabilize GHG emissions, the Protocol commits them to do so" (1).

The Clean Development Mechanism (CDM) established under the Kyoto Protocol. The CDM allows developing countries such as South Africa to implement GHG emission reduction projects and generate carbon credits.

(1) *Ibid.*

Annex B

Site Photographs

B1 SITE VISIT PICTURES

Figure 1.1 View of the site looking in a south easterly direction, showing the existing Transnet railway line and adjacent service road that transect the site

Figure 1.2 View of the site looking in a south easterly, showing the existing Transnet railway line and adjacent service road that transect the site

Figure 1.3 View of the 'initial PV footprint' site looking in an easterly direction

Figure 1.4 View of the 'initial PV footprint' site looking in an easterly direction

Figure 1.5 *Hills and mountains to the south east of the site.*

Figure 1.6 *Flat Terrain with ridge to the east of the site.*

Figure 1.7 *View of the 'current PV footprint site' looking in an easterly direction down the length of the site towards the mountains on the other side of the Great Fish River.*

Figure 1.8 *View of the 'current PV footprint site' looking in an easterly direction down the length of the site.*

Figure 1.9 *View of the 'current PV footprint' site, from the hills west of the site looking over the valley, with the site on the near side of the existing power lines.*

Figure 1.10 *Existing Drennan Traction Substation*

Figure 1.11 Existing Drennan Traction Substation Signage

Annex C

Public Participation Documentation

- Stakeholder Database
- Proof of Advertisement of Release of Draft Scoping Report
- Proof of Notification of Final Scoping Report (email and post)
- Public Meeting Minutes
- Public Meeting Attendance Register
- Comments

C1 STAKEHOLDER DATABASE

Name	Position	Organisation Name
EC: Inxuba Yethemba Local Municipality, Ward 6		
Mr Mzwandile Sydney Tantsi	Municipal manager	Inxuba Yethemba Local Municipality
Noxonolo Nontyi	Ward Councilor (ward 6)	Inxuba Yethemba Local Municipality
Nontyi Nwabisa	Community Development Worker (CDW)	Inxuba Yethemba Local Municipality
Nolothando Majiba	Manager: Community Services (Environmental person for LM)	Inxuba Yethemba Local Municipality
Lulamile Jojiyasi	LED Manager	Inxuba Yethemba Local Municipality
Chris Hani District Municipality		
Mrs Noxolo Nqwazi	Municipal manager	Chris Hani District Municipality
	Environmental Director / Manager	Chris Hani District Municipality
National Government		
Nyiko Nkosi	Administrator	Department of Environmental Affairs
Mr P Thabethe (Peter)	Acting Director General	National Gvt Dept: Agriculture, Forestry&Fisheries
Ms N Ngele (Nobubele)	Director General	National Government: Dept of Water Affairs
Eastern Cape		
Mr ML Zote	Provincial Manager	EC Provincial Heritage Resources Authority
Mr Bulumko Nelana	Head of Department Economic Development and Environmental Affairs	ECape Prov Gvt:Economic Development and Environmental Affairs
Mr Glen Thomas	Head of Department	Eastern Cape Provincial Department of Agriculture and Land Affairs
Ms Yvonne Matsheketwa	Senior Communications Officer	ECape Prov Gvt: Agriculture and Rural Development
Ms T Kgare	Head of Department	Department of Roads and Transport
Mr. Albert Mfenyana	Chief Director: Environmental Affairs	Department of Economic Development and Environmental Affairs
Govender, Jeff	Regional Manager Environmental Affairs	DEDEA (ELC)

Struwig, Andries	Case Officer	DEDEA (ELC)
Mr A Starkey	Chief Director: Eastern Cape	Department of Water Affairs
Ms Zoleka Capa	MEC:Rural Development and Agrarian Reform	Rural Development and Agriculture Reform
Other		
Mrs. Jenny Gon	Regional Chairperson	WESSA Eastern Cape
Mr. Dumisani Sibayi	Executive Officer Heritage Branch	South African Heritage Resources Agency (SAHRA) Head Office Cape Town
Mariagrazia Galimberti		South African Heritage Resources Agency (SAHRA)
Mrs Logashri Sewnarain	Regional Manager	SANRAL Eastern Region (Eastern Cape)
Ms Phindile Nzimande	The Chief Executive Officer	National Energy Regulator of South Africa (NERSA)
Mr Z Mokhine (Zini)	Chairperson	Earthlife Africa Johannesburg
Mr Shawn Johnston	Sustainable Development Practitioner	Sustainable Futures ZA
Ms. Sharlene Matthews	Office Manager	AgriSA (Eastern Cape)
Dr M du Plessis (Morne)	Chief Executive Officer	World Wide Fund South Africa
Mr Fanie van Aardt	Project Manager	SANRAL
		Transnet
		Eskom
Mr M. Marais		
Bradley Gibbons		African Crane Conservation Programme, Endangered Wildlife Trust
Rene de Kock	Statutory Control	SANRAL
Neighbouring Land Owners		
Rodney Taai	(Contact for Government Owned portion)	Farm 600
W.C Lombard	Affect landowner	Waterval Farm
Kobus De Klerk	Affect landowner	Sandheuwels
J.L De Klerk	Neighbouring landowner	Sandheuwels
Waterval Trust	Neighbouring landowner	Farm Blomfontein (no. 549)

Paul Abraham Schoeman Trustees	Neighbouring landowner	Farm Name Unknown (No. 580)
Christoffel Jacob Marthinus	Neighbouring landowner	Farm Dam Plaats (No. 529)
Greeff	Neighbouring landowner	Farm Blaauwekrans (No. 523)
Sieberhagen family Trust	Neighbouring landowner	Farm Name Unknown (No. 39/523)
Monley 2000 Cc	Neighbouring landowner	Farm Name Unknown (No. 573)
JL Jordaan Business Trust	Neighbouring landowner	Farm 600
Landowner		
Leon Scheepers	Affected Landowner	Dasendooor (Portion of 563) & Allehoop (Portion of 551)
Library		
Mrs Katie Bezuidenhout	Cradock Public Library	
Landowner Meeting 18 April 2012		
Mavis Dywili		
Mnr ME Scheepers		Monleo 2000cc
Mnr L Scheepers		

Figure 2.1 Proof of Advert(Cradock Courant)

Cradock Courant, Middelburg Courant, Somerset Budget, Winterberg Nous, Fort Beaufort Advocate Donderdag / Thursday 29 November 2012 9

Ernie Lombard on Nxuba Matters

The Eastern Cape government failed to achieve nearly half of all its delivery targets for the past financial year. The core delivery Departments of Health, Education, Rural Development and Agrarian Reform, and Social Development were the worst performers.
This is according to the latest analysis of the Auditor General's findings.
In total, the Eastern Cape only met an average of just 51.5% of the delivery targets set for the 2011/12 financial year. This raises the question of what government is spending the money on if it is not meeting its targets. I tend to think that too much money is being spent on service providers doing the work in the place of incompetent Civil Servants appointed for those purposes - it actually boils down to running a parallel Civil Service - Paying two to do the work of one! Another factor is the amount of money spent annually on litigation due to mistakes made by incompetent staff.) The Rural Development and Agrarian Reform Department, which should have the biggest impact on job creation, only reached 10% of its targets. This is a betrayal of the leading role agriculture should play in job creation. The Health Department reached just 41%, Education 35% and Social Development 28%.
Combined, these Departments shoulder the largest responsibility for improving the livelihood of the people of the Eastern Cape. The tragic consequences are most acutely felt in our schools and hospitals. This grand failure to deliver highlights the broken chain of accountability that flows from MECs right throughout government departments. Until there are consequences for poor performance nothing will change. This example is clearly not being set from the top, with Premier Noxolo Kiewiet's Office meeting just 57% of their targets.
Of even more concern is the fact that the one department which is supposed to assist NDLR4 and numerous other Municipalities regarding a Turnaround Strategy, namely the Department of Cooperative Governance and Traditional Affairs, was not even given an opinion by the Auditor General due to the fact that 35% of all information submitted was inaccurate!
While still not reaching acceptable performance levels, the better performing Departments were Treasury (71%), Economic Development (76%) and Sport, Recreation, Arts and Culture (67%).
Food for thought - In the Western Cape, four Govt Departments achieved CLEAN AUDITS (Unqualified with no findings) and 5 other Departments also achieved Unqualified (with minor technical findings). For those "not in the know" an Unqualified Audit is the highest category achievable.
The DA will push for performance contracts with the Eastern Cape Premier to be signed by all MECs. For the first time, these contracts need to be made public so that we can enforce accountability on those elected to govern. If targets are not met, then the MECs should be fired – simple as that.
In the Western Cape where the DA governs, stringent performance targets and accountability are enforced, nothing less is expected from the Eastern Cape government.
Numerous tar and concrete roads in Adelaide have been damaged by Amathole Water while doing maintenance and then merely filled with ground without repairing the damage. This practice has been ongoing ever since they took over the water supply function from Nxuba many years ago and no one in the Municipality seems to have been concerned about the huge potholes which developed subsequently. The general reply from Officials was" It is not our responsibility - Speak to Amathole". The fact of the matter is that no one, including the Officials or Councillors were prepared to take ownership of this problem. I have now tackled this matter and am pleased to report that after having taken photos and measurements of each and every pothole (+- 120mtrs) and presented the evidence to Senior Amathole Officials they have agreed to arrange for repairs to be expedited. The manholes on the exit road to Fort Beaufort have already been raised and repaired - now for the rest! I would like to extend my gratitude to SIRE' a new engineer at Amathole and also Vuyani from the local office for their appreciated assistance in this matter. A similar problem is experienced with the road to Bezuidenhoutville passing the Hospital. This however is a Provincial road which also falls outside the jurisdiction of Nxuba. I have engaged the Roads Engineer, Mr. Sonqaletha on three occasions and he has made "a solemn promise" to me that he will send his team to repair the potholes. (I have the email as evidence). This "promise" has not been met over a period of four months and I have now also learned not to make promises to the public on behalf of any officials, BUT I WILL PERSEVERE! Inwoners van Bezuidenhoutville het intussen so gatvol' gesuk vir die staggate dat hulle op eie inisiatief teer by die Municipaliteit gaan haal het en self begin het met die herstel van die gaat!
In my hoedanigheid as DA raadslid adsak vir Pieter die Lange en sy span helpers bedank vir hulle ontsaglike poging om in te spring en te help waar "SERVICE DELIVERY" in die Oos-Kaap so droewig faal. Hulle is ook van plan om die doringbome teenaan die pad af te saag - daar was jus Satterdagsand 'n ongeluk waarby 'n bees op die stuk pad doodgery is. Pieter and his helpers also mentioned that they were going to clear the furrow to the dam on their own accord if nothing is done soon. They are of the opinion that the responsible officials are not doing the required maintenance which they are being paid for as the furrow is totally overgrown and Bluegum trees are taking over the dam wall. It is incomprehensible that it always takes the public to have to point out matters like these to the authorities and not the local staff whom are supposed to be in charge.
I can also report that the portion of road near the farm of Dassie de Villiers and just other side the Waterkloof bridge will soon be properly re-gravelled and hopefully it won't be necessary for vehicles to be dragged out of the mud when it rains. (Hallo Daphnie!). The Contractor plans to do this portion within the following three weeks if there are no delays owing to rain.
Further good news is that we have convinced the Department of Roads and Public Works to stop the useless and wasteful practice of "dry blading" the gravel roads in the district. This process serves no purpose at all as the majority of the roads were back to their original poor condition within two weeks. "Wet blading" will be done in future and hopefully the condition of the roads will last longer in future. A three year contract has been awarded to Atticoast Civil Engineers with Penny Farthing as the Sub-Contractors whereby roads will be graded on a + - 6 month basis. Various other types of ongoing maintenance will also be done. I have attended all the Site Meetings of this project and am satisfied that under the auspices of Bill Emsley who is a seasoned Engineer in charge of the contract we will get genuine value for the little money awarded to this project. Jan Gouws has been acting Infrastructure Manager during the past three months and honestly needs to be congratulated on his achievements during this period. Mr. Gouws immediately realized the total mess and lack of control and supervision regarding various aspects in this department and promptly reacted by instilling numerous control measures. Amongst some of these are schedules regarding control over repairs to reported electrical problems and street lights. Locking devices have also been installed on all fuel tanks and access to keys are now controlled. Hopefully these will be diligently applied by other relief staff in future. The law demands that no official may act in any position for longer than three months at a time.
PRIDE and DEDICATION are not often found when we speak of SERVICE DELIVERY any more. I have noticed that workers refuse to assist with changing flat tyres on refuse vehicles as "it does not form part of their duties" and subsequently unnecessary delays are experienced in this department. One actually wonders whether this could possibly be a ploy to negate the excellent service Mr. Jan le Grange has established and instilled during the short period he has been assisting in this department. On one occasion when there was no co-operation from staff, Mr. Le Grange and one volunteer used a Nissan bakkie to remove all the refuse bags AND deposited them at the dumpsite from the whole of Bedford Town Proper. They started at 13:45 the afternoon and finished off at 17:45. This task is normally done with assistance of a huge hydraulic refuse vehicle, which does not have to make as many trips to the dump site, and four staff members. Makes one think - Mr. Le Grange must be close on 70 years of age and the two of them did the work of four workers with a smaller vehicle in a similar period! If this type of behaviour by the workforce persists it should be noted for future reference when the possibility of outsourcing such services could be investigated.
A new website has been developed for Nxuba Municipality with assistance from Amathole District Municipality. (Obviously also with assistance from a "Service Provider" even though normal qualifications for IT officers include Web page design as a standard module.) Hopefully all the relevant information as required by law (Budget, Idp, Policies, Bylaws, Financial reports etc) will be available on this site when launched.
The strike by the refuse removal team and electrical workers is now a thing of the past and these services should now return to normal. As an interim measure private contractors were engaged to assist with refuse removal and meter readers etc. were assisting on the electrical side. Baie dankie aan Jan Gouws, Grant Bishop en Jan le Grange wat gemelp het om die wa deur die drif te trek.
Christmas is around the corner and the Municipal Manager has assured Council that services will be provided during this period. Responsible people will be on duty to resolve any problems. This should be a welcome change from the past where the previous incompetent Municipal Manager and other Senior Managers would go on UNDESERVED vacation and leave the rest to the dogs without any contingency plans in place.
We are anxiously awaiting the latest report from the Auditor General in order to see whether all the hard work during the past three months will bear fruit. From what I believe " was dit maar 'n opdraande stryd" as things were not in a healthy state when the previous Chief Financial Officer and various other officials were suspended during the early part of this year. Achieving a clean audit does not happen overnight as it requires a totally different mindset from the staff compared to what was going on in Nxuba in the past. We have been assured that all the staff have now been retrained via assistance from Amathole District Municipality and various other Service Providers with the result that the Venus Accounting System can no longer be blamed for a bad report as in the past — even though the majority of the officials had been previously trained on this system and passed with "flying colours" as my investigations proved. Nxuba has been assisted by various Government Departments in working towards an improved Audit, but remember, "Rome was not built in one day". We need to thank the Municipal Manager, Mr J Caga and Ms. Mulinga (acting Chief Financial Manager) and various other staff members for their efforts during this period and hoping that all was not in vain—even the slightest improvement will be a ray of hope to the community!
Ernie Lombard
Pr. Cllr. Democratic Alliance
Nxuba Municipality

Megan Tapin (Parkhoof Berghaegga Nasionale Park), Lucius Modiman (Streekbestuurder – Grensstreek SANparke) en Bronwyn Botha (Projekbestuurder van die Korridorprojek) tydens die inligtingsessie by die Landbouskool Marlow net buite Cradock – *Foto Wilma de Klerk*

Korridorprojek Inligtingsvergadering

CRADOCK
'n Inligtingsvergadering waar boere en ander belangstellendes meer kon leer oor die voorgestelde korridorprojek om die waardevolle grasveld tussen Berghaegga Nasionale Park buite Cradock en Karnsberoo Nasionale Park buite Graaff-Reinet op 'n vrywillige basis deur grondeienaars te bewaar, is hierdie week gehou.
Volgens Bronwyn Botha, projekbestuurder, is hierdie 'n gesamentlike projek van die Wilderms Stigting en SANparke wat onder toesig van haar en in samewerking met 'n bestuurspan van beide die Stigting en SANparke plaasvind.
Botha sê die miljoene is om met behulp van grondeienaars die biodiversiteit van die habitat tussen Berghaegga en Karndeboo Nasionale Parke te beskerm deur middel van vrywillige ondernemings wat met privaat eienaars van plase in die area gesluit gaan word. Sy sê die beskerming van hierdie gebied se biodiversiteit is baie belangrik aangesien dit vier biome en ses hooftipes plantegroei insluit.
"Ons 's unieke samestelling van suidelike grasveld spesies en 'n baie belangrike voëlarea," het sy gesê en bygevoeg dat dit noodsaaklik is om hierdie gebied se plantegroei te beskerm teen skadelike ontwikkeling en verkeerde grondgebruik aldaarteen. Een van die miljoente van die projek is ook om ekotoerisme na die gebied te vestebet.
Volgens die voorgestelde korridorprojek kan boere self uit drie ooreenkomste van verskillende grade van betrokkenheidskies. Deelname is vrywillig en maak geen inbreuk op die boer se eiendomsreg nie. Boere kan nà die ooreenkomste gesluit is, nog voortgaan met hul gewone boerderypraktyke maar sal dan die beste bestuurspraktyke vir bewaring van die habitat vir kundiges kan ontvang. Boere ondertekenaars sien om die eiendom in ooreenkoms met voorgestelde riglyne, vir bewaring van die omgewing en dienslewe te bestuur.

Yellowwoods Preparatory School News

An important date is 4 December when the Christmas Season will be heralded in. It will start at 17.30 with a Christmas Market followed by a Carol Service. The Junior Primary Children and School Choir will perform in a special evening of song and verse.

An incredible fishing achievement is that of Yellowwoods pupil, Daniel Sparks, aged 10. He was fishing off the rocks at the Fish River Mouth with his Dad during the weekend when he landed, on his own, a beautiful, approximately 6 to 7kg Silver Steenbras after quite a battle to reel it in. Well done, Daniel.

Fourteen years sick leave raked up by Department of Local Government in 2011

Issued by: Dacre Haddon (MPL)
Shadow MEC for Local Government

Staff of the Department of Local Government was absent from work for an equivalent of 14 years in 2011.
This shocking information was tabled in a report to the Portfolio Committee of Local Government and Traditional Affairs in the Bhisho Legislature last week. A total of 5 125 sick days were taken between 1 January 2011 to 31 December 2011, costing the department Rd, 926 million.
Of the 5 125 sick days taken in 2011, 4 417 or 86% of the sick leave was amassed by skilled and managerial employees which equates to a cos of R961 per day per employee.
This answer was in response to questions raised by myself at the meeting.
On behalf of the Democratic Alliance I will be raising this issue in a speech to the next plenary session in the Legislature in December and will be publicly asking the MEC for Local Government, Mbki Qobosh iyane, why there is such a high sick rate and to supply details of how effective wellness plans are being rolled out in the department.
Furthermore I will early next year be requesting the portfolio committee to mandate that a thorough investigation be done as to what is causing the high levels of absenteeism and a review of effective wellness polices to be implemented in the department to radically reduce this problem.
In addition, the report states that all other leave taken by employees was not accurately recorded by the accounting officer.
Of further concern is that of the 3 329 posts available in the department only 1 593 were filled during the year, resulting in the department operating on a vacancy rate of 52 %.
With local government in crisis in his province it is unacceptable that the department has a high absenteeism rate which in turn delays crucial service delivery to communities.

KennisgewingVan Omgewings Impak Studie (OIS)

VOORGESTELDE DRENNAN SONKRAGJAANLEG
UITNODIGING VIR KOMMENTAAR

Solairedirect Suid Afrika (Edms) Bpark (hierna verwys as Solairedirect) is van voorneme om 'n fotovoltaïese (FV) sonkrag aanleg (hierdie projek) op 'n gedeelte van Plaas Drennan (twee voorlopige ontwikkelingsarea opsies is voorgestel, op Gedeelte 39 van Plaas 523 en Gedeelte 0 van Plaas 800 ("aanvanklike FV ontwikkelingsarea"), sowel as op Gedeelte 15 en 16 van Gedeelte 1 van die Plaas Waai Plaats (nr. 555) en Gedeelte 35 van Plaas 523 ("huidige FV ontwikkelingsarea), Cradock), Inxuba Yethemba Plaaslike Munisipaliteit, Oos-Kaap.
Die voorgestelde fasiliteit sal gebruik maak van fotovoltaïese (FV) selle om elektriseiteit op te wek wat by die Nasionale Kragnetwerk ingevoer sal word deur die beskikbare 132 kV Drennan elektriese substasie op die terrein.

OMVANGSBEPALING / OIB PROSES

Die voorgestelde ontwikkeling sluit in die oprigting van FV panele met 'n gekombineerde uitset van tot 80 MW en 'n gebied van omtrent 111 ha wat versteur kan word. Daar word omgewingsmagtiging deur die Departement van Omgewingsake (DOE) benodig vir hierdie proses, aan die hand van 'n Omgewings Impak Studie (OIS) Proses.
ERM Southern Africa (Edms) Bpk (ERM) is as onafhanklike omgewingskonsultant aangestel om bogenoemde OIS uit te voer. Hierdie advertensie dien as kennisgewing van die aanvang van die Proses van Openbare Deelname vir beide bogenoemde prosesse. Die Konsep Omvangsbepaling sal beskikbaar wees vir kommentaar vanaf 22 November 2012 tot 20 Januarie 2013. Die Konsep Omvangsbepaling sal beskikbaar wees in die Cradock Openbare biblioteek en op die webtuiste by http://www.erm.com/solairedirect-drennan. Verder sal daar 'n openbare vergadering gehou word om die projek te bespreek op 6 Desember 2012 in die Cradock Gemeenskapsaal, 24 Caleta Straat, Cradock. Om kommentaar te lewer op die voorgestelde projek en /of te registreer as 'n Belanghebbende of Geaffekteerde Party (GGP), kontak asb vir Toughseela Aspeling by ERM:
Tel: 021 702 9100; Faks: 086 632 5816; of
E-pos: drennan.solair@erm.com
Posadres: Postnet Suite 90, Privaatsak X12 Tokai 7966
Die volgende verwysingsinnemers moet asseblief deurgaans op alle korrespondensie gebruik word:
OIB DOS Verw.: 141310/9/3/2/088
ERM Verw.: 0166557
Kennisgewing gepubliseer hiermee van 'n Proses van Openbare Deelname en die voornemne om aansoek te doen vir Omgewingsmagtiging kragtens die OIS Regulasies van 21 April 2006 kragtens die NWOB (Wet 107 van 1998), soos gewysig. Die voorgestelde projek sluit/sluit Aktiwiteite 1(d), 1(i), 1(j), 1(l), 1(m), 2(b), 2(d), 2(f)(i) & (ii) van Staatskennisgewing R544 en Aktiwiteit 1.8 en 18 van Staatskennisgewing R545, sowel as Aktiwiteit 14 van Staatskennisgewing R546.

Figure 2.2 Proof of Advert (The Herald)

The Herald NEWS

Thursday November 22, 2012 3

Noakes weighs in on carbs, obesity

Sports scientist dispels food myths which have led to a spike in chronic illnesses

Euphonik's 'total blackout' over rumours

Khoza pulls out of Market Theatre event

Art & About

German DJs back at Godfather tomorrow

IN BRIEF

Film industry in NZ already 100 years old

Guardianship extended for star

Forgiven Witten set to resume duties

Notice of Environmental Impact Assessment (EIA)

PROPOSED DRENNAN PHOTOVOLTAIC (PV) SOLAR PARK

INVITATION TO COMMENT

SCOPING / EIA PROCESS

ERM

Fairview. Making new strides

Festival of Racing 2012

Celebrating our new home

Entrance is free

Gates open at 11am

Musical entertainment with Melissa from Idols on the 25th of November

Beer tent, food stalls & kids entertainment area

SALE

decofurn FACTORY SHOP

7 DAYS ONLY

R899 R399 R799 R899 R499 R699 R1799 R499

NO DEPOSIT

C3 PROOF OF NOTIFICATION OF FINAL SCOPING REPORT (EMAIL AND POST)

Figure 3.1 Proof of Email

From: Tougheeda Aspeling
To: Tougheeda Aspeling
Bcc: "nngcaba@environment.gov.za"; "mrabothata@environment.gov.za"; "dg@daff.gov.za"; "dodo@daff.gov.za"; "MGALIMBERTI@sahra.org.za"; "maboko@dwa.gov.za"; "lawrence.mgusi@agr.ecprov.gov.za"; "Alistair.McMaster@deaet.ecape.gov.za"; "mbote@ecphra.org.za"; "Bulumko.nelana@deaet.ecape.gov.za"; "glen.thomas@agr.ecprov.gov.za"; "Yvonne.Matsheketwa@agr.ecprov.gov.za"; "angie.majongile@dot.ecprov.gov.za"; "Albert.mfenyana@deaet.ecape.gov.za"; "davalan.govender@deaet.ecape.gov.za"; "andries.struwig@deaet.ecape.gov.za"; "starkeya@dwa.gov.za"; "malamlela.ndabankulu@agr.ecprov.gov.za"; "nnqwazi@chrishanidm.gov.za"; "lhel@chrishanidm.gov.za"; "tantsi@mtnloaded.co.za"; "nqonqolonontsi@iym.gov.za"; "nwai@72ovi.com"; "Lucille@iym.gov.za"; "lulamilej@webmail.co.za"; "J-Gon@intekom.co.za"; "dsibaya@sahra.org.za"; "L.Sewnarain@nra.co.za"; "sweetness.malete@nersa.org.za"; "zm@earthlife.org.za"; "mabule@ghouse.org.za"; "swjohnston@mweb.co.za"; "Sharlene.Matthews@agriec.co.za"; "mduplessis@wwf.org.za"; "scharlton@wwf.org.za"; "aardts@nra.co.za"; "pumelela.mabeka@transnet.net"; "Mavin.Bana@transnet.net"; "bradleyg@ewt.org.za"; "oouwsi@nra.co.za"; "Dekockr@nra.co.za"; "Jan@awardphoto.co.za"; "pwmichau@intekom.co.za"; "rodney.taai@dpw.gov.za"; "leon@r63.co.za"; "plscheepers@gmail.com"; "waterval@r63.co.za"
Subject: Notice of release of the Final Scoping Report for the Drennan Photovoltaic (PV) Power Facility, Eastern Cape
Date: 27 March 2013 03:12:00 PM
Attachments: All_stakeholders_VII.1_FSR_27032013.pdf
All_stakeholders_Afrikaans_VII.1_Final_27032013.pdf
image002.png

ERM Ref: 0166587
DEA Ref EIA: 14/12/16/3/3/2/359

Dear Stakeholder,

Notice of release of the Final Scoping Report for the Drennan Photovoltaic (PV) Power Facility, Eastern Cape

Solaire Direct is proposing to construct a 90 MW Photovoltaic (PV) Power Facility on the Drennan Site, on the remaining extent of Farm Drennan, Inxuba Yethemba Local Municipality, Eastern Cape. Please refer to the attached letter for further information about the project.

Please provide comment on or before 16 April 2013.

Thank you for your participation in this process.

Geagte Belanghebbende,

Vrystelling van die Konsep Finale Basiese Invloedverslag en Omvangsbepaling Verslag vir die Drennan Fotovoltaïese (FV) Krag Fasiliteit, Ooskaap

Solaire Direct is van voorneme om 'n 90 MW fotovoltaïese (PV) Krag Fasiliteit te bou op die Drennan terrein, op n gedeelte van Plaas Drennan, suid van Cradock in die Oos-Kaap Provinsie. Verwys asseblief na die aangehegte briewe en 'n hersiene Agtergrondinligtingsdokument (AID) vir verdere inligting oor die projek.

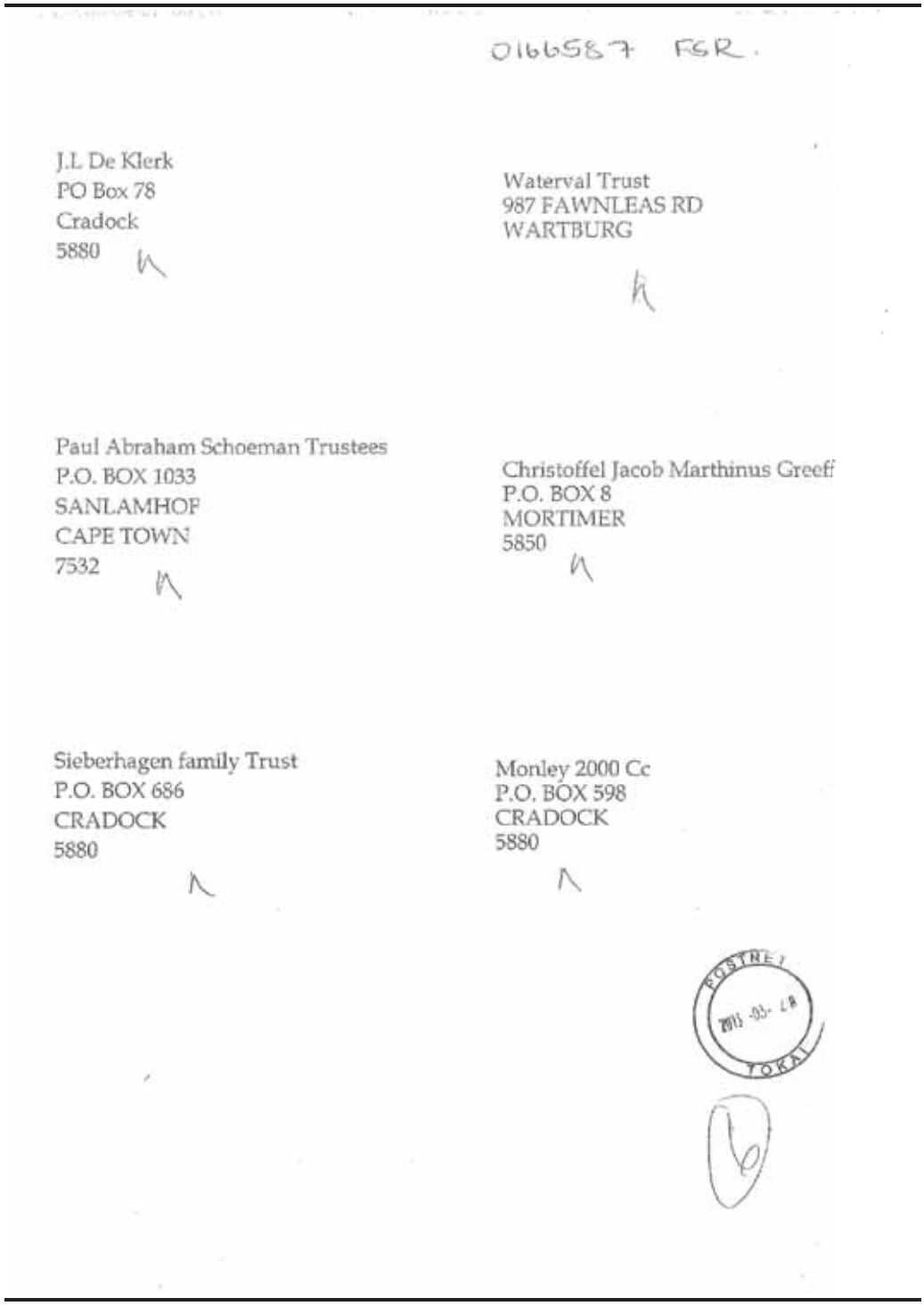
Kommentaar moet asseblief ingedien word voor of op 16 April 2013.

Dankie vir u deelname in hierdie proses.

Yours sincerely/ Die uwe

Dean Alborough
Project manager

Figure 3.2 Proof of Postage



0166587 FSR.

J.L De Klerk
PO Box 78
Cradock
5880

Waterval Trust
987 FAWNLEAS RD
WARTBURG

Paul Abraham Schoeman Trustees
P.O. BOX 1033
SANLAMHOF
CAPE TOWN
7532

Christoffel Jacob Marthinus Greeff
P.O. BOX 8
MORTIMER
5850

Sieberhagen family Trust
P.O. BOX 686
CRADOCK
5880

Monley 2000 Cc
P.O. BOX 598
CRADOCK
5880

POSTNET
2015 -05- 28
TOKAI

Meeting minutes

Environmental Resources Management

2nd Floor | Great Westerford | 240 Main Road | Rondebosch | 7700 | Cape Town | South Africa
T +27 21 681 5400
F +27 21 686 0736
http://www.erm.com

Subject/Ref	Solaire Direct EIA Process for Photovoltaic Facility in Drennan, Eastern Cape: Public Meeting
Venue	Cradock Town Hall
Date of Meeting	6 December 2012
Present	Dean Alborough, Mariam January, Reggie Niemand, Mavis Dywili, Mnr ME Scheepers, Mnr L Scheepers.
Distribution	To be included into Environmental Impact Assessment Report
Date	10 December 2012

Attendance Register follows these minutes.

Introduction

Mariam January (MJ) of ERM welcomed attendees to the meeting and introduced the members of the ERM team and the proponent's representative, Mr Reggie Niemand (RN) of Solaire Direct. MJ outlined the purpose of the meeting as well as the ground rules for discussions. She confirmed language protocol and proposed that although the presentations would be in English, participants should feel free to address the meeting in the language of their preference.

Project Description Presentation

Dean Alborough (DA) presented an overview of the proposed Solaire Direct Photovoltaic Facility, which included information on the project rationale, the site selection process, project location, project components, project activities and alternatives.

Environmental Impact Assessment (EIA) process

DA briefly explained the EIA and associated public participation process. He indicated the different stages of the EIA process and current progress towards submission of the reports to the national Department of Environmental Affairs (DEA). He explained when and how public input is sought throughout the process and emphasised the importance of such, for an integrated decision-making process. DA outlined the expected impacts associated with the proposed project and explained the process being undertaken by ERM, namely an EIA process for the proposed 90 MW facility.

Facilitated Discussion

The points raised during the presentation were discussed in more detail during the facilitated discussion that followed. These points as well as further points raised and discussed are recorded below. Note that the comments and concerns have been grouped according to the nature of the issue.

Comments /concerns raised:	Response:
Mnr L Scheepers questioned as to the process that had been followed in selecting the portion 15/1/550 of land that the current PV footprint is planned to be developed on.	RN responded that initially Solaire Direct had wanted to develop on land portions 39/523 and 0/600. However, the landowner of those portions had later decided to use those land portions for cultivation. Solaire Direct then considered portion 16/1/550, but the landowner had stated that this portion was also going to be used for cultivation. Therefore another alternative location on portion 15/1/550 had been decided on.
Mnr L Scheepers Stated that he is in fact the rightful landowner of portions 39/523 and 16/1/550 and had not been consulted. Further that portion 0/600 had been sold to the government.	RN responded that Solaire Direct will check again on the land deeds and communicate with Mnr L Scheepers.
Mnr L Scheepers questioned how much water would be required for the construction and operation of the PV facility.	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.

Comments /concerns raised:	Response:
Mnr ME Scheepers asked what kind of PV panel technology will be used, and would it be rotating or fixed PV panels.	DA responded that the project intends to use fixed PV panels on aluminium frames.
Mnr ME Scheepers asked if overhead powerlines would be required across the land portions.	RN responded that one alternative is to use overhead powerlines from the proposed new substation to the existing Drennan substation, and another alternative considered is to connect directly to the existing overhead powerline on portion 15/1/550 from the proposed new substation and so no overhead powerline would be required.
Mnr ME Scheepers stated that there had been concerns with renewables projects such as wind farms regarding the impacts on traffic, and would this be the case for this project.	DA responded that the impacts on transport and traffic for wind farm developments are different to those for a PV facility. A PV facility uses fewer trucks and construction equipment, and the trucks would not be carrying abnormal loads. 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.
Mnr L Scheepers: There is no farm called Drennan. That parcel of land, portion 16/1/550 belongs to Mnr Scheepers.	RN responded that the project was labelled based on the road signage and the name of the substation on the farm.
Mnr L Scheepers: We have no complaints against the project. We simply want to ensure that the issue of land ownership is sorted out as soon as possible.	RN responded that this issue will receive urgent attention. Solaire Direct will verify the owners and feedback to Mnr Scheepers as soon as possible.

DRENNAN SCOPING PUBLIC MEETING

06 December 2012

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Email Address	Postal Address
EAP DEAN ALBOROUGH	ERM	CONSULTANT	021 702 9100	0217017900	DEAN.ALBOROUGH@ERM.COM	BLOCK A SILVERWOOD HOUSE STEENBERG CAPE TOWN 7945
Mnr. M.E. Scheepers	Monleo 2000 CC	Member	0721045584	0865405729	morneerwinscheepers@gmail.com	Dassiedeur P.O. Box 598 Cradock 5880
PA NIEMAND	Savannah Direct	Project Developer	0827741233		rniemand@savannahdirect.co.za	

DRENNAN SCOPING PUBLIC MEETING

06 December 2012

ATTENDANCE REGISTER

Title, First name & Surname	Organisation Name	Position in Organisation	Telephone / Cellphone Numbers	Fax Number	Email Address	Postal Address
EG MARIAM JANUARY	ERM	CONSULTANT	021 702 9900	021 7017900	mariam.january@erm.com	Block A Silverwood House Silverwood close Steenberg CAPE TOWN 7945
Mavis Dywili	IYM Inxuba Yethemba Municipality.	Secretary	0781390830	0488811421	Mavis@iym.gov.za	2 Sifonelo Str. Lingelihle Cradock 5881.
MR. L. SCHEEPERS	MONLEO 2000 CC	MEMBER	0826512694	0865605729	leon@mb3.co.za.	P.O. BOX 598 CRADOCK 5880

Leon Scheepers Familie Trust

(Reg. Nr: IT 292/96)
BTW. Nr: 416 018 4844

P.O Box 598
CRADOCK
5880
Tel: 048 8860 653
Fax: 086 540 5729
Cell: 082 651 2494
E-Mail: leon@r63.co.za

Posbus 598
CRADOCK
5880
Tel. 048 8860 653
Faks: 086 540 5729
Sel: 082 651 2494
E-Pos: leon@r63.co.za

16 January 2013

Att: Dean Alborough/Tougheeda Aspeling of ERM

Re: Proposed Drennan 90MW Photovoltaic (PV) Power Facility, Eastern Cape
ERM Ref: 0166587
DEA Ref: 14/12/16/3/3/2/359

Dear Sir/Madam

I, Leon Johann Scheepers, ID no: 5501295061081, would like to make use of the invitation to comment on the proposed 90MW Photovoltaic (PV) Power Facility on behalf of the Leon Scheepers Familie Trust (Reg. no: IT292/96) in my capacity as founder and trustee. The said trust holds 100% of the membership interest in following close corporations, *Leon Ontwikkelings CC, Sevenstone Investments 105 CC and Monleo 2000 CC*, thus authorizing me to act in their interests. The mentioned close corporations respectively own land that could either be directly affected by the proposed development or borders property earmarked for development.

Leon Ontwikkelings CC:
Reg. no: 2007/086696/23
Title Deed no: T8141/1968
Property Description: Das en Door, Farm 563
Location: East-southeast of site

Sevenstone Investments 105 CC:
Reg. no: 2004/012023/07
Title Deed no: T64564/2005
Property Description: Portion 526/550, 7/563 and the remainder of portion 551
Location: East of site

Monleo 2000 CC:
Reg. no: 2007/076764/23
Title Deed no: T79749/2004
Property Description: Portion 39/523 (Initial PV Footprint) and 16/1/551
Location: West-northwest of site

Please be so kind to add the above information to your "*Stakeholder Database*" in Annex C. Upon thorough revision of the "*Draft Scoping Report (DSR)*" a number of concerns came to light.

1. Firstly, page 18 section 4.4 of the DSR reads as follow. "*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.*" This statement however is false. The initial PV footprint that is referred to is located on portion 39/523 that is owned by Monleo 2000 CC. At no known point in time was the property owner or representative ever informed or consulted, by any consultant or representative of Solaire Direct, on the proposed development. I strongly object to this statement. The section of land indicated as the "initial PV footprint" located on portion 39/523 (green hatched lines indicated in Figure 4.2 Current PV Footprint Map, pg 19 of DSR) is NOT suited for future agricultural development, and is therefore available for the proposed development. The person(s) who made this statement or supplied the information was not authorized to provide any information or to represent Monleo 2000 CC, thus acting in deceptive manner by misrepresenting the owner of portion 39/523.

2. Secondly, page 2 "Annex G – Maps", indicates a new 11kV transmission power line that transverses portion 16 of portion1 of Waaiplaatz no. 550 (16/1/550) from the 'current PV footprint (15/1/550) to 132kV Drennan Traction Substation. The owner of portion 16/1/550, Monleo 2000 CC, was never consulted or informed about the construction of a new 11kV transmission power line parallel to the existing 132kV Eskom transmission line. Also, the same map indicates an existing road (portion16/1/550) that will be utilized to gain access the proposed site. Kindly note that there was no consultation or permission granted regarding the use of this road.

I am in favour of the development of cleaner energy alternatives to conventional energy generation methods. Thus, I am willing to negotiate the use of the property portion 39/523 (located directly adjacent to the 132kV Drennan Traction substation) for the potential development of a Photovoltaic Power Facility. I also feel that the use of 39/523 is more suitable for the development of a Photovoltaic Power Facility than the "*current PV footprint*" proposed on portion 15/1/550 for the following reasons:

1. The locality of portion 39/523 is geographically more suited due to the predominant north facing slope compared to the south facing slope of "*current PV footprint*" proposed on portion 15/1/550.
2. The length of the 11kV transmission power line required to connect to the 132kV Drennan Traction Substation will be dramatically decreased (form approximately 2000m to +-50m).
3. Should portion 39/523 be considered; only one land owner will have to be consulted and negotiated with.
4. With portion 39/523 being directly adjacent to the Drennan Traction Substation, the guard and administration facilities will also be able to provide the necessary supervision at the Drennan Traction Substation, as well as the adjacent PV facility.
5. The owner of portions 39/523 and 16/1/550, Monleo 2000 CC, is also prepared to negotiate for a larger section of land should there in future be plans for expanding the PV Facility. With a combined area of approximately 1800ha available for future development bordering the Drennan Traction Substation.

I trust that my concerns and suggestions would be taken up as a priority matter. I also want to invite the developer to engage with Monleo 2000 CC in negotiation, as Monleo 2000 CC was never consulted regarding the availability and the use of any of its property and would welcome the opportunity to be part of a more sustainable future.

Kind regards

Leon J Scheepers
Trustee, Leon Scheepers Family Trust

Leon Scheepers Familie Trust

(Reg. Nr: IT 292/96)
BTW. Nr: 416 018 4844

P.O Box 598
CRADOCK
5880
Tel: 048 8860 653
Fax:
Sel: 082 651 2494
E-Pos: leon@r63.co.za

Posbus 598
CRADOCK
5880
Tel. 048 8860 653
Faks:
Cell: 082 651 2494
Email: leon@r63.co.za

15 April 2013

Att: Nosipho Ngcaba of Department of Environmental Affairs

Cc: Dean Alborough/Tougheeda Aspeling of ERM; Reggie Niemand of Solairedirect SA; Ryan Hammond of Solairedirect SA

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

ERM Ref: 0166587

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

Dear Sir/Madam

Your invitation to comment on the Final Scoping Report regarding the proposed Drennan Photovoltaic Power Facility has reference.

On 20 January 2013 I submitted a comment by facsimile to your offices marked for the attention of Mr. Dean Alborough as well as a copy to Mr. Reggie Niemand of Soliaredirect. On Monday 21st I received telephonic confirmation from both parties, that they have received the faxes and that it would receive their attention. Upon close study of the Final Scoping Report, I found that **none** of my comments were reacted on or included as part of Annexure D Comments & Report.

The stakeholder data base still contains some duplications and errors. J.L. de Klerk and Kobus de Klerk of the farm Sandheuwel is the same person. The landowners - Leon Ontwikkelings cc, Sevenstone Investments 105 cc and Monleo 2000cc (note the spelling) are still not listed in the stakeholders database with the relevant Deed numbers as included in the original comments letter dated 16 January 2013. The Sieberhagen Family Trust is not the owner of portion 39/523, but of Eglington Farm. Portion 39/523 is the property of Monleo 2000 cc. J.L. Jordaan Business Trust is not the owners of farm 600. Farm 600 is registered to the Republic of South Africa.

The subsequent sections of the Final Scoping Report also contains the following errors:

Paragraph 3.1.2 - Site notices:

The site notices were only erected during October 2012 and not March 2012 as indicated in annex C. This was also the first time that the existence of a proposed solar farm became public knowledge, while some of the studies were already done in March/April 2012.

Paragraph 4.2 - Project location and existing land use:

The Drennan railway station is located on the eastern border of the proposed site. The station consist i.a. of 12 dwellings that are occupied by pensioners and or people working as casual labourers on neighbouring farms. This station is located between the Great Fish River and the site and is approximately away. According to Annex E, a 1 km buffer zone is required from any residential area. How will this community be affected and more have they been consulted regarding the proposed development?

Agricultural activities are conducted on both banks of the Great Fish River as well as on farm 600 where 2x13ha centre pivots can be found adjacent to Drennan Railway station in an eastern direction.

Paragraph 4.4.5 - Access roads and internal paths:

The GPS reading 32°25'29.39"S 25°43'12.68"E is the location of the initial PV footprint situated on farm 39/523 next to the Drennan SUBSTATION. The correct coordinates for the entrance to portion 15/1/550 is 32°26'16.9"S 25°44'13.07"E. This is the entrance next to the houses at Drennan Railway station at portion 15/1/550.

Table D 1.2. - Comments and Responses report:

During the public meeting held on 6 December 2012 held at Cradock Public Library, L. Scheepers raised the query: Who is the person that indicated that portions 39/523 and 16/1/550 would be used for cultivation?

Reggie Niemand responded: "Wentzel Lombard indicated that he owns different closed corporations and they own these properties." It is of interest to note that Lombard is a trustee of Waterval Trust who owns portion 15/1/550. He is in no legal position to act on behalf of Leon Ontwikkelings cc, Sevenstone Investments 105 cc and Monleo 2000 cc. This response was never included in the transcript of the public meeting.

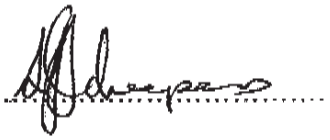
During the presentation of Mr. Dean Alborough, Mr Reggie Niemand did a Deed search that indicated that farms 39/523 and 16/1/550 were registered to Monleo 2000cc. He indicated that this was an embarrassment to him and he apologised for taking Lombard's word on face value. He was also informed that farm 600 was sold to the Government, but it was still in the process of being transferred. He was also given the particulars of the conveyance attorney to have it verified.

Annex B - Site photographs:

Figures 1.1; 1.2; 1.3; 1.4; 1.5 and 1.6 were taken from the initial footprint and have no bearing on the proposed site. A photograph(s) of the railway station would be more appropriate.

I trust that my concerns and suggestions would be taken up as a priority matter. I also want to again invite the developer and the respective stakeholders to engage with Monleo 2000 cc in negotiation, as mentioned Monleo 2000 cc was never consulted regarding the availability as well as the use of any of it's properly and would welcome the opportunity to be part of a cleaner, more sustainable, future.

Kind regards



Leon J Scheepers

Trustee, Leon Scheepers Family Trust

Environmental Resources Management

Cape Town Office
ERM Southern Africa
2nd Floor, Great Westerford Building
240 Main Road
Rondebosch, Cape Town
7725
Tel: +27 (0) 21 681 5400
Fax:+27 (0) 21 686 0736
www.erm.com

Postal Address:
Postnet Suite 90
Private Bag X12
Tokai, 7966
South Africa

07 February 2013

Mr. Leon Scheepers
P O Box 598
Cradock
5880

ERM Ref: 0166587
DEA Ref: 14/12/16/3/3/2/359

Dear Mr Scheepers

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

Thank you for sending through your comments on the relevant project. We will include your comment into the comments and responses section in the Final Scoping Report with all other comments received with responses.

Please contact Dean Alborough on Tel: 021 681 5400, Fax: 021 686 0736 Email: Dean.alborough@erm.com, should you have any queries.

Yours sincerely

Dean Alborough
Project Manager

Registered Company address:
Environmental Resources Management
Southern Africa (Pty) Ltd
Building 32, 1ST Floor
The Woodlands Office Park,
Woodlands Drive, Woodmead, 2148

Company registration number
2003 / 001404 / 07

Directors
Bruce Walker (Managing)
Grant Bassingthwaighte
Jeremy Soboil
John Simonson (UK)
Tania Swanepoel

Offices worldwide

A member of the Environmental Resources Management Group

Dean Alborough

From: Reggie Niemand <rniemand@solairedirect.co.za>
Sent: 17 April 2013 03:03 PM
To: Leon Scheepers; nngcaba@enviroment.gov.za
Cc: drennan.solar@erm.co; Dean Alborough
Subject: RE: Proposed Drennan PV Facility - Comments on Final Scoping Report

Hello Mr Scheepers

I trust all is well.

We hereby acknowledge your email and ERM will respond to your concerns.

Kind regards

Reggie

From: Leon Scheepers [mailto:leon@r63.co.za]
Sent: 16 April 2013 03:35 PM
To: nngcaba@enviroment.gov.za
Cc: drennan.solar@erm.co; dean.alborough@erm.com; Reggie Niemand
Subject: Proposed Drennan PV Facility - Comments on Final Scoping Report

Good day

Please find our comments on the Final Scoping Report for the Proposed Drennan 90MW Photovoltaic Facility attached. A copy of the original comments letter sent to ERM in January 2013 is also included.

If any further questions or uncertainties arise, please do not hesitate to contact me. I trust that our comments and interests will be regarded as a priority.

Kind regards

Leon Scheepers
Trustee: Leon Scheepers Familie Trust
Cradock
Cell: 082 6512494

Annex D

Comments and Responses Report

Table D1.1 Abbreviations

RN	Reggie Niemand (representative of Solaire Direct)
DA	Dean Alborough (representative of Environmental Resources Management)
ERM	Environmental Resources Management
MW	Megawatts
I & APs	Interested and Affected Parties

Table D1.2 Comments and Responses Report for the Scoping Phase

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
Query as to the process that had been followed in selecting the portion 15/1/550 of land that the current PV footprint is planned to be developed on.	Mnr ME Scheepers	Public Meeting Cradock Town Hall 6 December 2012	RN responded that initially Solaire Direct had wanted to develop on land portions 39/523 and 0/600. However, the landowner of those portions had later decided to use those land portions for cultivation. Solaire Direct then considered portion 16/1/550, but the landowner had stated that this portion was also going to be used for cultivation. Therefore another alternative location on portion 15/1/550 had been decided on.
Mnr L Scheepers stated that he is in fact the rightful landowner of portions 39/523 and 16/1/550 and had not been consulted. Further that portion 0/600 had been sold to the government.	Mnr ME Scheepers	Public Meeting Cradock Town Hall 6 December 2012	RN responded that Solaire Direct will check again on the land deeds and communicate with Mnr L Scheepers.
Statement that there was no farm called Drennan. That parcel of land, portion 16/1/550 belongs to Mnr Scheepers.	Mnr L Scheepers	Public Meeting Cradock Town Hall 6 December 2012	RN responded that the project was labelled based on the road signage and the name of the substation on the farm.
Query as to how much water would be required for the construction and operation of the PV facility.	Mnr ME Scheepers	Public Meeting Cradock Town Hall 6 December 2012	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

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
			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.
Query as to what kind of PV panel technology would be used, and would it be rotating or fixed PV panels.	Mnr L Scheepers:	Public Meeting Cradock Town Hall 6 December 2012	DA responded that the project intends to use fixed PV panels on aluminium frames.
Query regarding whether overhead powerlines would be required across the land portions.	Mnr L Scheepers:	Public Meeting Cradock Town Hall 6 December 2012	RN responded that one alternative is to use overhead powerlines from the proposed new substation to the existing Drennan substation, and another alternative considered is to connect directly to the existing overhead powerline on portion 15/1/550 from the proposed new substation and so no overhead powerline would be required.
View stated that there had been concerns with renewables projects such as wind farms regarding the impacts on traffic, and would this be the case for this project.	Mnr L Scheepers	Public Meeting Cradock Town Hall 6 December 2012	DA responded that the impacts on transport and traffic for wind farm developments are different to those for a PV facility. A PV facility uses fewer trucks and construction equipment, and the trucks would not be carrying abnormal loads. 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.

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
			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.
Statement that there were no complaints against the project. We simply want to ensure that the issue of land ownership is sorted out as soon as possible.	Mnr L Scheepers	Public Meeting Cradock Town Hall 6 December 2012	RN responded that this issue will receive urgent attention. Solaire Direct will verify the owners and feedback to Mnr Scheepers as soon as possible.
Query as to whether an additional overhead power line be needed?	Mnr L Scheepers	Public Meeting Cradock Town Hall 6 December 2012	There is the possibility of one more overhead power line. However, there is also the possibility to link in and link out of the existing power line.
I, Leon Johann Scheepers, ID no: 5501295061081, would like to make use of the invitation to comment on the proposed 90MW Photovoltaic (PV) Power Facility on behalf of the Leon Scheepers Familie Trust (Reg. no: IT292/96) in my capacity as founder and trustee. The said trust holds 100% of the membership interest in following close corporations, Leon Ontwikkelings CC, Sevenstone Investments 105 CC and Monleo 2000CC, thus authorizing me to act in their interests. The mentioned close corporations respectively own land that could either be directly affected by the proposed development or borders property earmarked for the development. <u>Leon Ontwikkelings CC</u>: Reg. no: 2007/086696/23 Title Deed no: T8141/1968 Property Description: Das en Door, Farm 563 Location: East-southeast of site	Mnr L Scheepers	Letter 16 January 2013	Status of Mnr Leon Scheepers and associated companies is noted.

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
Sevenstone Investments 105 CC: Reg. no: 2004/012023/07 Title Deed no: T64564/2005 Property Description: Portion 526.550, 7/563 and the remainder of portion 551 Location: East of site Monleo 2000 CC: Reg. no: 2007/076764/23 Title Deed no: T79749/2004 Property Description: Portion 39/523 (Initial PV Footprint) and 16/1/551 Location: West-northwest of site			
Please be so kind to add the above information to your "Stakeholder Database" in Annex C. Upon thorough revision of the "Draft Scoping Report (DSR)" a number of concerns came to light.			The Stakeholder Database has been updated with this information, see *Annex C*.
1. Firstly, page 18 section 4.4 of the DSR reads as follow. "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." This statement however is false. The initial PV footprint that is referred to is located on portion 39/523 that is owned by Monleo 2000 CC. At no known point in time was the property owner or representative ever informed or consulted, by any consultant or representative of Solaire Direct, on the proposed development. I strongly object to this statement. The section of land indicated as the "initial PV footprint" located on portion 39/523 (green hatched lines indicated in Figure 4.2 Current PV Footprint Map, pg 19 of DSR) is NOT suited for future agricultural development and is therefore available for the proposed development. The person(s) who made this statement or supplied the information was not authorized to provide any information or to represent Monleo 2000 CC, thus acting in deceptive manner by misrepresenting the owner of portion 39/523.			The initial phase of the EIA process and the Draft Scoping Report erroneously included three farm portions, one of which was portion 39/523 based on information supplied at that time. Once Mnr Leon Scheepers raised the concern on the 6 December 2012 at the public meeting the project description and site location was revised to only include farm portion 15/1/550, land which is owned by Mnr Wentzel Lombard with whom Solaire Direct have a commercial relationship. The additional three farm portions are no longer required for the Project. The revised project description and site location was detailed in the Final Scoping Report.

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
2. Secondly, page 2 "Annex G – Maps", indicates a new 11kV transmission power line that traverses portion 16 of portion 1 of Waaiplaatz no. 550 (16/1/550) from the 'current PV footprint (15/1/550) to 132kV Drennan Traction Substation. The owner of the portion 16/1/550, Monleo 2000 CC, was never consulted or informed about the construction of a new 11kV transmission power line parallel to the existing 132kV Eskom transmission line. Also, the same map indicates an existing road (portion16/1/550) that will be utilized to gain access the proposed site. Kindly note that there was no consultation or permission granted regarding the use of this road.	Mnr L Scheepers	Letter 16 January 2013	As mentioned above the farm portion 16/1/550 was erroneously included as part of the site location. Farm portion 16/1/550 is no longer required for the Project. The site location was revised to only include farm portion 15/1/550, which was detailed in the Final Scoping Report.
I am in favour of the development of cleaner energy alternatives to conventional energy generation methods. Thus, I am willing to negotiate the use of the property portion 39/523 (located directly adjacent to the 132kV Drennan Traction substation) for the potential development of a Photovoltaic power Facility. I also feel that the use of 39/523 is more suitable for the development of a Photovoltaic Power Facility that the "current PV footprint" proposed on portion 15/1/550 for the following reasons:	Mnr L Scheepers	Letter 16 January 2013	Mnr Leon Scheepers willingness to engage with Solaire Direct is is acknowledged and thanked.
1. The locality of portion 39/523 is geographically more suited due to the predominant north facing slope compared to the south facing slope of "current PV footprint" proposed on portion 15/1/550. 2. The length of the 11kV transmission power line required to connect to the 132kV Drennan Traction Substation will be dramatically decreased (from approximately 2000m to +- 50m). 3. Should portion 39/523 be considered; only one landowner will have to be consulted and negotiated with. 4. With portion 39/523 being directly adjacent to the Drennan Traction Substation, the guard and administration facilities will also be able to provide the necessary supervision at the Drennan Tractions Substation, as well as the adjacent PV facility. 5. The owner of portions 39/523 and 16/1/550, Monleo 2000 CC, is also prepared to negotiate for a larger section of land should there in future be plans for expanding the PV Facility. With a combined area of approximately 1800ha available for future development bordering the Drennan Traction Substation.			The points raised by Mnr Leon Scheepers as to why he considers portion 39/523 a more suitable development site are acknowledged. However, as mentioned above portion 39/523 and 16/1/550 are no longer required for the Project, and Solaire Direct currently has a commercial relationship with the owner of portion 15/1/550.
I trust that my concerns and suggestions would be taken up as apriority matter. I also want to invite the developer to engage			Mnr Leon Scheepers issues raised were taken up by Solaire Direct as a priority and the decision was taken to amend the project

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
with Monleo 2000 CC in negotiation, as Monleo 2000 CC was never consulted regarding the availability and the use of any of its property and would welcome the opportunity to be part of a more sustainable future.			description and limit the site location to portion 15/1/550. These changes were reflected in the Final Scoping Report.
Dear Sir / Madam Your invitation to comment on the Final Scoping Report regarding the proposed Drennan Photovoltaic Power Facility has reference. On 20 January 2013 I submitted a comment by facsimile to your offices marked for the attention of Mr Dean Alborough as well as a copy to Mr Reggie Niemand of Solairedirect. On Monday 21st I received telephonic confirmation from both parties, that they have received the faxes and that it would receive their attention. Upon close study of the Final Scoping Report, I found that none of my comments were reacted on or included as part of Annexure D Comments & Report (*sic*).	Mnr L Scheepers	Letter 15 April 2013	ERM thanks Mnr Leon Scheepers for engaging in the EIA process. At the time of publishing the Final Scoping Report it was ERM's position that the issues raised by Mnr Leon Scheepers concerning land portions had been adequately captured in the comments and responses of the public meeting minutes. However, in order to respond to Mnr Leon Scheepers concern raised here, ERM has included the full letter dated 16 January 2013, and given further responses to this letter, as detailed above.
The stakeholder data base still contains some duplications and errors. J.L. de Klerk and Kobus de Klerk of the farm Sandheuwel is the same person. The landowners – Leon Ontwikkelings cc, Sevenstone Investments 105 cc and Monleo 2000cc (note the spelling) are still not listed in the stakeholders database with the relevant Deed numbers as included in the original comments letter dated 16 January 2013. The Sieberhagen Family Trust is not the owner of portion 39/523, but of Eglington Farm. Portion 39/523 is the property of Monleo 2000 cc (*sic*). J.L. Jordaan Business Trust is not the owners of farm 600. Farm 600 is registered to the Republic of South Africa.	Mnr L Scheepers	Letter 15 April 2013	The Stakeholder Database has been updated with this information.
The subsequent sections of the Final Scoping Report also contains the following errors: Paragraph 3.1.2 – Site notices: The site notices were only erected during October 2012 and not March 2012 as indicated in Annex C. This was also the first time that the existence of a proposed solar farm became public knowledge, while some of the studies were already done in March / April 2012.	Mnr L Scheepers	Letter 15 April 2013	*Annex C* of the Final Scoping Report does not reference the date of when the Site Notices were erected. *Section 3.1.1* of the Final Scoping Report does make reference to Site Notices being erected in March. Unfortunately this was an error in the report. The Site Notices were not erected at that time as the Project was put on hold and not initiated by the developer. The project resumed commencement in October 2012, and from this time the public participation process began for the Project. This has been corrected in the Draft EIR. Some initial baseline and reconnaissance studies were undertaken for the Site.
Paragraph 4.2 – Project location and existing land use:	Mnr L	Letter	Attachment *A. EIA INFORMATION REQUIRED FOR SOLAR*

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
The Drennan railway station is located on the eastern border of the proposed site. The station consist i.a. of 12 dwellings that are occupied by pensioners and or people working as casual labourers on neighbouring farms. The station is located between the Great Fish River and the site and is approximately away (*sic*). According to Annex E, a 1 km buffer zone is required from any residential area. How will this community be affected and more have they been consulted regarding the proposed development? Agricultural activities are conducted on both banks of the Great Fish River as well as on farm 600 where 2x13ha centre pivots can be found adjacent to Drennan Railway station in an eastern direction.	Scheepers	15 April 2013	*ENERGY FACILITIES* from the Acknowledgement of Receipt and Acceptance of the Environmental Authorisation dated 20 June 2012 contained in Annex E of the Final Scoping Report states that information required includes: "*Buffer zones (also where it is dictated by elements outside the site):* • *500m from any irrigated agricultural land* • *1km from residential areas* *Indicate isolated residential, tourism facilities on or within 1km of the site*" A socio-economic specialist study has been undertaken for the Project (see *Chapters 6* and *12* of the Draft EIR). It is ERM's position that the dwellings mentioned by Mnr Leon Scheepers, which fall just more than 500m to the east of the proposed PV footprint do not constitute a formal residential area. Instead the 12 dwellings constitute isolated residential dwellings on or within 1km of the Site. As per the DEA requirement these dwellings have been indicated in *Figure 10.10* of the Draft EIR. A consultation process specifically with the residents of the 12 dwellings will be undertaken during this assessment phase, and the results of which will be incorporated in the Final EIR. The closest irrigated agricultural land is located approximately 650m to the east of the PV footprint, located on the opposite side of the railway line. Therefore this is more than the DEA required 500m buffer zone as mentioned above.
Paragraph 4.4.5 – Access roads and internal paths: The GPS reading 32º25'29.39"S 25º43'12.68"E is the location of the initial PV footprint situated on farm 39/523 next to the Drennan Substation. The correct coordinates for the entrance to portion 15/1/550 is 32º26'16.9"S 25º44'13.07"E. This is the entrance next to the houses at Drennan Railway station at portion 15/1/550.	Mnr L Scheepers	Letter 15 April 2013	Thank you for pointing out the correction required. The coordinates for the proposed Site entrance have been updated to 32º26'26.66"S 25º43'50.39"E in the Draft EIR. Please see *Annex L* for project specifications.
Table D 1.2 – Comments and Responses report: During the public meeting held on 6 December 2012 held at Cradock Public Library, L. Scheepers raised the query: Who is the person that indicated that portions 39/523 and 16/1/550 would be used for cultivation? Reggie Niemand responded: "Wentzel Lombard indicated that he owns different closed corporations and they own these properties." It is of interest to note that Lombard is a trustee of	Mnr L Scheepers	Letter 15 April 2013	Noted.

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
Waterval Trust who owns portion 15/1/550. He is in no legal position to act on behalf of Leon Ontwikkelings cc, Sevenstone Investments 105 cc and Monleo 2000 cc. This response was never included in the transcript of the public meeting. During the presentation of Mr. Dean Alborough, Mr Reggie Niemand did a Deed search that indicated that farms 39/523 and 16/1/550 were registered to Monleo 2000cc. He indicated that this was an embarrassment to him and he apologised for taking Lombard's word on face value. He was also informed that farm 600 was sold to the Government, but it was still in the process of being transferred. He was also given the particulars of the conveyance attorney to have it verified.			As mentioned above, following the public meeting held on the 6 December 2012, the project description and Site location were revised to exclude farm portions 39/523, 600 and 16/1/550. The revised project description and Site location were captured in the Final Scoping Report.
Annex B – Site photographs: Figures 1.1; 1.2; 1.3; 1.4; 1.5; and 1.6 were taken from the initial footprint and have no bearing on the proposed site. A photograph(s) of the railway station would be more appropriate.	Mnr L Scheepers	Letter 15 April 2013	Noted. Additional photographs will be added to the report where possible.
I trust that my concerns and suggestions would be taken up as a priority matter. I also want to again invite the developer and the respective stakeholders to engage with Monleo 2000 cc in negotiation, as mentioned Monleo 2000 cc was never consulted regarding the availability as well as the use of any of it's property and would welcome the opportunity to be part of a cleaner, more sustainable, future.	Mnr L Scheepers	Letter 15 April 2013	ERM thanks Mnr Leon Scheepers for engaging in the public participation process. Mnr Leon Scheepers interest to engage has been passed on to Solaire Direct.
PROPOSED 90 MW DRENNAN PHOTOVOLTAIC (PV) POWER FACILITY, EASTERN CAPE This office acknowledges receipt of the Final Scoping report for the above-mentioned project from Solaire Direct. <u>Comments from Water Quality Management</u> <u>Concerns:</u> The fact that the proposed development will take place in/near/over/through various water courses and resources. <u>Suggestion(s):</u> Ensure that the proposed development adheres to all the conditions set forth in the National Water Act (Act 36 of 1998) and that all water uses are identified according to the National Water Act, 1998 (Act 36 of 1998). Ensure that effective stormwater management is addressed in a subsequent report. The fuel storage facilities should have a bunded wall around	Mnr M. Bloem Chief Director Eastern Cape	Department of Water Affairs (DWA) 17 May 2013	Noted. The proposed Current PV Footprint avoids any drainage lines on the site, and only existing roads will be upgraded. Noted. All water courses have been identified in the EIR and buffers applied. Stormwater management measures have been addressed in *Chapter 7* and *Annex K* (EMPr) of the EIR. This mitigation measure has been included in *Annex K* (EMPr).

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team
them with a volume greater than the capacity of fuel storage tank, in order to contain any potential spill. None of the wash water used to clean the solar panels may enter into any water resource. Avoid construction within the drainage lines. <u>Register for:</u> No water uses need to be registered for sections 21(e), (f), (g) or (h) in terms of the National Water Act (Act 36 of 1998). <u>Recommendations for the EIA process:</u> State clearly where all the water for this development will be sourced from during every stage of the development.			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. Intermittent cleaning of the panels will be carried out as necessary which is anticipated to be once or twice a year. Care will be taken to ensure that none of the wash water used to clean the solar panels will enter into any watercourses. The Current PV Footprint and project infrastructure avoids the drainage lines on the site. Noted. Water requirements for the project are discussed in *Chapter 4* of the EIR.
<u>Comments from Resource Protection</u> The proposed PV solar facility may affect watercourses in the area, namely Great Fish River, its tributary and drainage lines. In terms of Chapter 4 of the National Water Act, 1198 (Act No 36 of 1998) (the Act), any proposed development within the extent of a watercourse i.e. 1:100 year floodline or the delineated riparian habitat, whichever is the greatest constitutes a Section 21 water use. Therefore, if the following activities will be within the extent of the watercourses: • The placement of PV panels and module mountings; • Construction of a substation, on site buildings etc; • Internal access roads, underground cabling and pylons; and • Any other structure and / or infrastructure. A water use authorization in terms of Section 21(c) and (i) of the Act will be required for impeding or diverting the flow of water in a watercourse, and altering the bed, banks, course or characteristics of a watercourse respectively. If any of the above mentioned activities triggers a Section 21 (c)	Mnr M. Bloem Chief Director Eastern Cape	Department of Water Affairs (DWA) 17 May 2013	Noted: It is however anticipated that the Site will not fall within the 1:100 year floodline, given the characteristics of the terrain relative to the Great Fish River in the vicinity of the Site, as well as the fact that Transnet deemed it suitable to locate the railway in its current position in proximity to the Site. Nonetheless the 1:100 year floodline study is currently underway and will be included in the final EIR.

Issues/Comments Raised	Commentator(s)	Source	Response from Project Team

and (i) water use, the following information should be submitted as part of the application:
• Section 21 (c) and (i) forms (can be provided on request)
• Section 21 (c) and (i) Water Use Supplementary Information Questionnaire (can be provided on request)
• A master layout plan showing all the project's activities in relation to the delineated 1:100 year floodline for the affected watercourses and a legible 1:50 000 topographic locality map
• Stormwater Management Plan
• Rehabilitation Plan for all the disturbed areas
• Monitoring Programme
• Method Statement
• Civil design drawings for the structures
• A technical report stipulating the Geotechnical and Geohydrological studies
• If any wetland will be affected, wetland delineation and assessment with 500m radius mapped around all wetlands should be conducted
• Impact / Risk Assessment of the water use activities on the watercourses; with specific reference to the following characteristics:
  • Flow regime
  • Water quality
  • Riparian habitat (extent of clearing and disturbance)
  • Biota			

It was relayed to Solaire Direct by Mr Wentzel Lombard that he is currently renting some properties located on the Project Site from Transnet and that there is currently one occupant of the aforementioned properties, that being a farm labourer employed by Mr Wentzel Lombard. *With regards to the forgoing, on the 31st of July 2013 Transet approved an application by Mr Wentzel Lombard for the rental of Transet properties NBl toNBl0 Drennan (10 units), for the period of eight months, commencing 1 August 2013 (see Annex E).*	Mr Reggie Niemand	Solaire Direct South Africa.	

Annex E

Authority and Landowner Communications

- Acknowledgment of Receipt and Acceptance of Final Scoping Report by the DEA
- Department of Water Affairs (DWA) Comments
- Water Allocation Confirmation
- Eskom Housing Lease Agreement

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Fedsure Building · 315 Pretorius Street · PRETORIA
Tel (+ 27 12) 310 3911 · Fax (+ 2712) 322 2682

NEAS Reference: DEA/EIA/0001283/2012
DEA Reference: 14/12/16/3/3/2/359
Enquiries: Mmatlala Rabothata
Tel: 012 395 1768/1694 **Fax:** 012 320 7539 **E-mail:** mrabothata@environment.gov.za

Ms Tania Swanepoel
Environmental Resources Management Southern Africa (Pty) Ltd
Postnet Suite 624
Private Bag x29
GALLO MANOR
2052

Fax: 021 701 7900
Tel: 021 702 9100

PER FACSIMILE / MAIL

Dear Ms Swanepoel

ACKNOWLEDGEMENT OF RECEIPT AND ACCEPTANCE OF NEW APPLICATION FOR ENVIRONMENTAL AUTHORISATION (SCOPING & EIA PROCESS) FOR THE PROPOSED CONSTRUCTION AND OPERATION OF THE 90MW DRENNAN PHOTOVOLTAIC (PV) SOLAR PARK, INXUBA YETHEMBA LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE

The Department confirms having received the Application Form; Details of EAP and Declaration of Interest; Project Schedule; Landowner Consent Notice and locality map on 6 June 2012 for environmental authorisation for the abovementioned project. The Application is accepted.

Please include both reference numbers (NEAS Reference and DEA Reference), as listed above, on all documents and correspondence submitted to the Department.

Please note that *one hard copy and one electronic copy (saved on CD/DVD) of draft reports*, and *five hard copies and one electronic copy of final reports* must be submitted to the Department.

In addition, please consider the following during compilation of reports for this application for environmental authorisation:

- All applicable Departmental Guidelines must be considered throughout the application process. These can be downloaded from the Department's website: www.environment.gov.za, Environmental Impact Management button, listed under "EIA Administration": Integrated Environmental Management Information Series link. These include, but are not limited to, the following topics: Scoping, Environmental Impact Reporting, Stakeholder Engagement, Specialist Studies, Impact Significance, Cumulative Effects Assessments, Alternatives in EIA and Environmental Management Plans.

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- Please be advised that in terms of the EIA Regulations and NEMA the investigation of alternatives is mandatory. Alternatives must therefore be identified, investigated to determine if they are feasible and reasonable. It is also mandatory to investigate and assess the option of not proceeding with the proposed activity (the "no-go" option).
- Refer to the attached annexure for specific requirements for the submission of applications for environmental authorisation for solar/wind power generation facilities.
- Should water, solid waste removal, effluent discharge, stormwater management and electricity services be provided by the municipality, you are requested to provide this office with written proof that the municipality has sufficient capacity to provide the necessary services to the proposed development. Confirmation of the availability of services from the service providers must be provided together with the reports to be submitted.
- In the reports to be submitted it must clearly be demonstrated in which way the proposed development will meet the requirements of sustainable development. You must also consider energy efficient technologies and water saving devices and technologies for the proposed development. This could include measures such as the recycling of waste, the use of low voltage or compact fluorescent lights instead of incandescent globes, maximising the use of solar heating, the use of dual flush toilets and low-flow shower heads and taps, the management of storm water, the capture and use of rainwater from gutters and roofs, the use of locally indigenous vegetation during landscaping and the training of staff to implement good housekeeping techniques.
- A detailed and complete EMPr must be submitted with the EIR. This EMPr must not provide recommendations but must indicate actual remediation activities which will be binding on the applicant. Without this EMPr the documents will be regarded as not meeting the requirements and will be returned to the applicant for correction.
- The applicant/EAP is required to inform this Department in writing upon submission of any draft report, of the contact details of the relevant State Departments (that administer laws relating to a matter affecting the environment) to whom copies of the draft report were submitted for comment. Upon receipt of this confirmation, this Department will in accordance with Section 24O (2) & (3) of the National Environmental Management Act, 1998 (Act 107 of 1998) inform the relevant State Departments of the commencement date of the 40 day commenting period, or 60 days in the case of the Department of Water Affairs for waste management activities which also require a licence in terms of the National Water Act, 1998 (Act 36 of 1998).
- Should it be necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999), please submit the necessary application to SAHRA or the relevant provincial heritage agency and submit proof thereof with the Environmental Impact assessment Report. The relevant heritage agency should also be involved during the public participation process and have the opportunity to comment on all the reports to be submitted to this Department.

You are required to submit the final site layout plan together with the Final EIR to the Department. All available biodiversity information must be used in the finalisation of the layout plan. The site layout plan must indicate the following:

- Positions of solar/wind facilities;
- Foundation footprint;
- Permanent laydown area footprint;
- Construction period laydown footprint;

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- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of Heritage sites;
- Sub-station(s) and/or transformer(s) sites including their entire footprint;
- Cable routes and trench dimensions (where they are not along internal roads);
- Connection routes (including pylon positions) to the distribution/transmission network;
- Cut and fill areas at solar panels/ wind turbines sites along roads and at sub-station/transformer sites indicating the expected volume of each cut and fill;
- Borrow pits;
- Spoil heaps (temporary for topsoil and subsoil and permanently for excess material);
- All existing infrastructure on the site, especially roads;
- Buildings including accommodation;
- All "no-go" areas; and
- A map combining the final layout plan must be superimposed (overlain) on the environmental sensitivity map.

The Environmental Management Programme (EMPr) submitted as part of the application for environmental authorisation must include the following:

- All recommendations and mitigation measures to be recorded in the Final EIR.
- A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to commencement of the construction phase.
- An open space management plan to be implemented during the construction and operation of the facility.
- A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility including timeframes for restoration which must indicate rehabilitation within the shortest possible time after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
- A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
- An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

- An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
- A traffic management plan for the site access roads to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

The EAP must, in order to give effect to regulation 56 (2), before submitting the final basic assessment report/environmental impact assessment report to the Department give registered interested and affected parties access to, and an opportunity to comment on the report in writing within 21 days.

In terms of regulation 67 of the EIA Regulations, 2010 this application will lapse if the applicant (or the EAP on behalf of the applicant) fails to comply with a requirement in terms of the Regulations for a period of six months after having submitted the application, unless the reasons for failure have been communicated to and accepted by this Department.

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

Yours sincerely

Mr Ishaam Abader
Deputy Director-General: Environmental Quality and Protection
Department of Environmental Affairs
Letter signed by: Ms Mmatlala Rabothata
Designation: Environmental Officer: Environmental Impact Evaluation
Date: 20/06/2012

CC:	Mr Ryan Hammond	Solaire Direct Southern Africa	Fax: 021 685 9591
	Mr Cira Ngeetu	Eastern Cape DEDEA	Fax: 045 838 3931
	Mr Mzwandile Sydney Tantsi	Inxuba Yethemba Local Municipality	Fax: 048 881 1421

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A. EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES

1. General site information

The following general site information is required:

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

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

2. Site maps and GIS information

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

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map/layer must be provided that includes the following:
  - Current use of land on the site including:

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- Buildings and other structures
- Agricultural fields
- Grazing areas
- Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
- Critically endangered and endangered vegetation areas that occur on the site
- Bare areas which may be susceptible to soil erosion
- Cultural historical sites and elements

➢ Rivers, streams and water courses

➢ Ridgelines and 20m continuous contours with height references in the GIS database

➢ Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs

➢ High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries

➢ Buffer zones (also where it is dictated by elements outside the site):

- 500m from any irrigated agricultural land
- 1km from residential areas

➢ Indicate isolated residential, tourism facilities on or within 1km of the site

- A slope analysis map/layer that include the following slope ranges:

➢ Less than 8% slope

➢ between 8% and 12% slope

➢ between 12%and 14% slope

➢ steeper than 18 % slope

- A map/layer that indicate locations of birds and bats including roosting and foraging areas (specialist input required)
- A site development proposal map(s)/layer(s) that indicate:

➢ Positions of solar facilities

➢ Foundation footprint

➢ Permanent laydown area footprint

- Construction period laydown footprint
- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
- River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
- Substation(s) and/or transformer(s) sites including their entire footprint.
- Cable routes and trench dimensions (where they are not along internal roads)
- Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM)
- Cut and fill areas along roads and at substation/transformer sites indicating the expected volume of each cut and fill
- Borrow pits
- Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
- Buildings including accommodation

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

3. Regional map and GIS information

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

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - roads including their types (tarred or gravel) and category (national, provincial, local or private)
  - Railway lines and stations
  - Industrial areas
  - Harbours and airports
  - Electricity transmission and distribution lines and substations

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- Pipelines
- Waters sources to be utilised during the construction and operational phases
- A visibility assessment of the areas from where the facility will be visible
- Critical Biodiversity Areas and Ecological Support Areas
- Critically Endangered and Endangered vegetation areas
- Agricultural fields
- Irrigated areas
- An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams

4. Important stakeholders

Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Request for comment must be submitted to:

Mrs. Anneliza Collett
Directorate: Land Use & Soil Management
Department of Agriculture, Forestry & Fisheries
Tel: 012 - 319 7508
Fax: 012 - 329 5938
e-mail: AnnelizaC@nda.agric.za
www.agis.agric.za

In addition, comments must be requested from Eskom (Mr Kevin Leask or Mr Ronald Marais (011) 8008111) regarding grid connectivity and capacity.

B. AGRICULTURE STUDY REQUIREMENTS

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point

- Soil colour
- Limiting factors
- Clay content
- Slope of the site
- A detailed map indicating the locality of the soil forms within the specified area,
- Size of the site

- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)
- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map

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environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Fedsure Building · 315 Pretorius Street · PRETORIA
Tel (+ 27 12) 310 3911 · Fax (+ 2712) 322 2682

NEAS Reference: DEA/EIA/0001292/2012
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Enquiries: Mmatlala Rabothata
Tel: 012 395 1768/1694 **Fax:** 012 320 7539 **E-mail:** mrabothata@environment.gov.za

Ms Tania Swanepoel
Environmental Resources Management Southern Africa (Pty) Ltd
Postnet Suite 624
Private Bag x29
GALLO MANOR
2052

Fax: 021 701 7900
Tel: 021 702 9100

PER FACSIMILE / MAIL

Dear Ms Swanepoel

ACKNOWLEDGEMENT OF RECEIPT AND ACCEPTANCE OF NEW APPLICATION FOR ENVIRONMENTAL AUTHORISATION (BASIC ASSESSMENT PROCESS) FOR THE PROPOSED CONSTRUCTION AND OPERATION OF THE 10MW DRENNAN PHOTOVOLTAIC (PV) SOLAR PARK, INXUBA YETHEMBA LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE

The Department confirms having received the application form; details of EAP and Declaration of Interest; Project Schedule; Landowner Consent Notice and locality map on 6 June 2012 for environmental authorisation for the abovementioned project. The Application is accepted.

Please include both reference numbers (NEAS Reference and DEA Reference), as listed above, on all documents and correspondence submitted to the Department.

Please note that *one hard copy and one electronic copy (saved on CD/DVD) of draft reports*, and *five hard copies and one electronic copy of final reports* must be submitted to the Department.

In addition, please consider the following during compilation of reports for this application for environmental authorisation:

- All applicable Departmental Guidelines must be considered throughout the application process. These can be downloaded from the Department's website: www.environment.gov.za, Environmental Impact Management button, listed under "EIA Administration": Integrated Environmental Management Information Series link. These include, but are not limited to, the following topics: Scoping, Environmental Impact

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Reporting, Stakeholder Engagement, Specialist Studies, Impact Significance, Cumulative Effects Assessments, Alternatives in EIA and Environmental Management Plans.

- Please be advised that in terms of the EIA Regulations and NEMA the investigation of alternatives is mandatory. Alternatives must therefore be identified, investigated to determine if they are feasible and reasonable. It is also mandatory to investigate and assess the option of not proceeding with the proposed activity (the "no-go" option).
- Refer to the attached annexure for specific requirements for the submission of applications for environmental authorisation for solar power generation facilities.
- Should water, solid waste removal, effluent discharge, stormwater management and electricity services be provided by the municipality, you are requested to provide this office with written proof that the municipality has sufficient capacity to provide the necessary services to the proposed development. Confirmation of the availability of services from the service providers must be provided together with the reports to be submitted.
- In the reports to be submitted it must clearly be demonstrated in which way the proposed development will meet the requirements of sustainable development. You must also consider energy efficient technologies and water saving devices and technologies for the proposed development. This could include measures such as the recycling of waste, the use of low voltage or compact fluorescent lights instead of incandescent globes, maximising the use of solar heating, the use of dual flush toilets and low-flow shower heads and taps, the management of storm water, the capture and use of rainwater from gutters and roofs, the use of locally indigenous vegetation during landscaping and the training of staff to implement good housekeeping techniques.
- A detailed and complete EMPr must be submitted with the BAR. This EMPr must not provide recommendations but must indicate actual remediation activities which will be binding on the applicant. Without this EMPr the documents will be regarded as not meeting the requirements and will be returned to the applicant for correction.
- The applicant/EAP is required to inform this Department in writing upon submission of any draft report, of the contact details of the relevant State Departments (that administer laws relating to a matter affecting the environment) to whom copies of the draft report were submitted for comment. Upon receipt of this confirmation, this Department will in accordance with Section 24O(2) & (3) of the National Environmental Management Act, 1998 (Act 107 of 1998) inform the relevant State Departments of the commencement date of the 40 day commenting period, or 60 days in the case of the Department of Water Affairs for waste management activities which also require a licence in terms of the National Water Act, 1998 (Act 36 of 1998).
- Should it be necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999), please submit the necessary application to SAHRA or the relevant provincial heritage agency and submit proof thereof with the Basic Assessment Report. The relevant heritage agency should also be involved during the public participation process and have the opportunity to comment on all the reports to be submitted to this Department.

You are required to submit the final site layout plan together with the Final BAR to the Department. All available biodiversity information must be used in the finalisation of the layout plan. The site layout plan must indicate the following:

- Positions of solar facilities;
- Foundation footprint;
- Permanent laydown area footprint;
- Construction period laydown footprint;

- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of Heritage sites;
- Sub-station(s) and/or transformer(s) sites including their entire footprint;
- Cable routes and trench dimensions (where they are not along internal roads);
- Connection routes (including pylon positions) to the distribution/transmission network;
- Cut and fill areas at solar panels sites along roads and at sub-station/transformer sites indicating the expected volume of each cut and fill;
- Borrow pits;
- Spoil heaps (temporary for topsoil and subsoil and permanently for excess material);
- All existing infrastructure on the site, especially roads;
- Buildings including accommodation;
- All "no-go" areas; and
- A map combining the final layout plan must be superimposed (overlain) on the environmental sensitivity map.

The Environmental Management Programme (EMPr) submitted as part of the application for environmental authorisation must include the following:

- All recommendations and mitigation measures to be recorded in the Final BAR.
- A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to commencement of the construction phase.
- An open space management plan to be implemented during the construction and operation of the facility.
- A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility including timeframes for restoration which must indicate rehabilitation within the shortest possible time after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
- A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
- An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

- An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
- A traffic management plan for the site access roads to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

The EAP must, in order to give effect to regulation 56 (2), before submitting the final Basic Assessment Report to the Department give registered interested and affected parties access to, and an opportunity to comment on the report in writing within 21 days.

In terms of regulation 67 of the EIA Regulations, 2010 this application will lapse if the applicant (or the EAP on behalf of the applicant) fails to comply with a requirement in terms of the Regulations for a period of six months after having submitted the application, unless the reasons for failure have been communicated to and accepted by this Department.

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

Yours sincerely

Mr Ishaam Abader
Deputy Director-General: Environmental Quality and Protection
Department of Environmental Affairs
Letter signed by: Ms Mmatlala Rabothata
Designation: Environmental Officer: Environmental Impact Evaluation
Date: 20/06/2012

CC:	Mr Ryan Hammond	Solaire Direct Southern Africa	Fax: 021 685 9591
	Mr Cira Ngeetu	Eastern Cape DEDEA	Fax: 045 838 3931
	Mr Mzwandile Sydney Tantsi	Inxuba Yethemba Local Municipality	Fax: 048 881 1421

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A. EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES

1. General site information

The following general site information is required:

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

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

2. Site maps and GIS information

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

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map/layer must be provided that includes the following:
  - Current use of land on the site including:
    - Buildings and other structures
    - Agricultural fields
    - Grazing areas
    - Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
    - Critically endangered and endangered vegetation areas that occur on the site
    - Bare areas which may be susceptible to soil erosion
    - Cultural historical sites and elements
  - Rivers, streams and water courses
  - Ridgelines and 20m continuous contours with height references in the GIS database
  - Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs

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- High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
- Buffer zones (also where it is dictated by elements outside the site):
  - 500m from any irrigated agricultural land
  - 1km from residential areas
- Indicate isolated residential, tourism facilities on or within 1km of the site

- A slope analysis map/layer that include the following slope ranges:
  - Less than 8% slope
  - between 8% and 12% slope
  - between 12%and 14% slope
  - steeper than 18 % slope
- A map/layer that indicate locations of birds and bats including roosting and foraging areas (specialist input required)
- A site development proposal map(s)/layer(s) that indicate:
  - Positions of solar facilities
  - Foundation footprint
  - Permanent laydown area footprint
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  - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
  - River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
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  - Cut and fill areas along roads and at substation/transformer sites indicating the expected volume of each cut and fill
  - Borrow pits
  - Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
  - Buildings including accommodation

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

3. Regional map and GIS information

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

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - roads including their types (tarred or gravel) and category (national, provincial, local or private)
  - Railway lines and stations
  - Industrial areas
  - Harbours and airports
  - Electricity transmission and distribution lines and substations

- Pipelines
- Waters sources to be utilised during the construction and operational phases
- A visibility assessment of the areas from where the facility will be visible
- Critical Biodiversity Areas and Ecological Support Areas
- Critically Endangered and Endangered vegetation areas
- Agricultural fields
- Irrigated areas
- An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams

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Directorate: Land Use & Soil Management
Department of Agriculture, Forestry & Fisheries
Tel: 012 - 319 7508
Fax: 012 - 329 5938
e-mail: AnnelizaC@nda.agric.za
www.agis.agric.za

In addition, comments must be requested from Eskom (Mr Kevin Leask or Mr Ronald Marais (011) 8008111) regarding grid connectivity and capacity.

B. AGRICULTURE STUDY REQUIREMENTS

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site; on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point
  - Soil colour
  - Limiting factors
  - Clay content
  - Slope of the site
  - A detailed map indicating the locality of the soil forms within the specified area,
  - Size of the site
- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)

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- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Fedsure Building · 315 Pretorius Street · PRETORIA
Tel (+ 27 12) 310 3911 · Fax (+ 2712) 322 2682

NEAS Reference: DEA/EIA/0001283/2012
DEA Reference: 14/12/16/3/3/2/359
Enquiries: Mmatlala Rabothata
Tel: 012 395 1768/1694 **Fax:** 012 320 7539 **E-mail:** mrabothata@environment.gov.za

Ms Tania Swanepoel
Environmental Resources Management Southern Africa (Pty) Ltd
Postnet Suite 624
Private Bag x29
GALLO MANOR
2052

Fax: 021 701 7900
Tel: 021 702 9100

PER FACSIMILE / MAIL

Dear Ms Swanepoel

ACKNOWLEDGEMENT OF RECEIPT AND ACCEPTANCE OF NEW APPLICATION FOR ENVIRONMENTAL AUTHORISATION (SCOPING & EIA PROCESS) FOR THE PROPOSED CONSTRUCTION AND OPERATION OF THE 90MW DRENNAN PHOTOVOLTAIC (PV) SOLAR PARK, INXUBA YETHEMBA LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE

The Department confirms having received the Application Form; Details of EAP and Declaration of Interest; Project Schedule; Landowner Consent Notice and locality map on 6 June 2012 for environmental authorisation for the abovementioned project. The Application is accepted.

Please include both reference numbers (NEAS Reference and DEA Reference), as listed above, on all documents and correspondence submitted to the Department.

Please note that *one hard copy and one electronic copy (saved on CD/DVD) of draft reports*, and *five hard copies and one electronic copy of final reports* must be submitted to the Department.

In addition, please consider the following during compilation of reports for this application for environmental authorisation:

- All applicable Departmental Guidelines must be considered throughout the application process. These can be downloaded from the Department's website: www.environment.gov.za, Environmental Impact Management button, listed under "EIA Administration": Integrated Environmental Management Information Series link. These include, but are not limited to, the following topics: Scoping, Environmental Impact Reporting, Stakeholder Engagement, Specialist Studies, Impact Significance, Cumulative Effects Assessments, Alternatives in EIA and Environmental Management Plans.

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- Please be advised that in terms of the EIA Regulations and NEMA the investigation of alternatives is mandatory. Alternatives must therefore be identified, investigated to determine if they are feasible and reasonable. It is also mandatory to investigate and assess the option of not proceeding with the proposed activity (the "no-go" option).
- Refer to the attached annexure for specific requirements for the submission of applications for environmental authorisation for solar/wind power generation facilities.
- Should water, solid waste removal, effluent discharge, stormwater management and electricity services be provided by the municipality, you are requested to provide this office with written proof that the municipality has sufficient capacity to provide the necessary services to the proposed development. Confirmation of the availability of services from the service providers must be provided together with the reports to be submitted.
- In the reports to be submitted it must clearly be demonstrated in which way the proposed development will meet the requirements of sustainable development. You must also consider energy efficient technologies and water saving devices and technologies for the proposed development. This could include measures such as the recycling of waste, the use of low voltage or compact fluorescent lights instead of incandescent globes, maximising the use of solar heating, the use of dual flush toilets and low-flow shower heads and taps, the management of storm water, the capture and use of rainwater from gutters and roofs, the use of locally indigenous vegetation during landscaping and the training of staff to implement good housekeeping techniques.
- A detailed and complete EMPr must be submitted with the EIR. This EMPr must not provide recommendations but must indicate actual remediation activities which will be binding on the applicant. Without this EMPr the documents will be regarded as not meeting the requirements and will be returned to the applicant for correction.
- The applicant/EAP is required to inform this Department in writing upon submission of any draft report, of the contact details of the relevant State Departments (that administer laws relating to a matter affecting the environment) to whom copies of the draft report were submitted for comment. Upon receipt of this confirmation, this Department will in accordance with Section 240 (2) & (3) of the National Environmental Management Act, 1998 (Act 107 of 1998) inform the relevant State Departments of the commencement date of the 40 day commenting period, or 60 days in the case of the Department of Water Affairs for waste management activities which also require a licence in terms of the National Water Act, 1998 (Act 36 of 1998).
- Should it be necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999), please submit the necessary application to SAHRA or the relevant provincial heritage agency and submit proof thereof with the Environmental Impact assessment Report. The relevant heritage agency should also be involved during the public participation process and have the opportunity to comment on all the reports to be submitted to this Department.

You are required to submit the final site layout plan together with the Final EIR to the Department. All available biodiversity information must be used in the finalisation of the layout plan. The site layout plan must indicate the following:

- Positions of solar/wind facilities;
- Foundation footprint;
- Permanent laydown area footprint;
- Construction period laydown footprint;

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- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of Heritage sites;
- Sub-station(s) and/or transformer(s) sites including their entire footprint;
- Cable routes and trench dimensions (where they are not along internal roads);
- Connection routes (including pylon positions) to the distribution/transmission network;
- Cut and fill areas at solar panels/ wind turbines sites along roads and at sub-station/transformer sites indicating the expected volume of each cut and fill;
- Borrow pits;
- Spoil heaps (temporary for topsoil and subsoil and permanently for excess material);
- All existing infrastructure on the site, especially roads;
- Buildings including accommodation;
- All "no-go" areas; and
- A map combining the final layout plan must be superimposed (overlain) on the environmental sensitivity map.

The Environmental Management Programme (EMPr) submitted as part of the application for environmental authorisation must include the following:

- All recommendations and mitigation measures to be recorded in the Final EIR.
- A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to commencement of the construction phase.
- An open space management plan to be implemented during the construction and operation of the facility.
- A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility including timeframes for restoration which must indicate rehabilitation within the shortest possible time after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
- A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
- An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

- An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
- A traffic management plan for the site access roads to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

The EAP must, in order to give effect to regulation 56 (2), before submitting the final basic assessment report/environmental impact assessment report to the Department give registered interested and affected parties access to, and an opportunity to comment on the report in writing within 21 days.

In terms of regulation 67 of the EIA Regulations, 2010 this application will lapse if the applicant (or the EAP on behalf of the applicant) fails to comply with a requirement in terms of the Regulations for a period of six months after having submitted the application, unless the reasons for failure have been communicated to and accepted by this Department.

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

Yours sincerely

Mr Ishaam Abader
Deputy Director-General: Environmental Quality and Protection
Department of Environmental Affairs
Letter signed by: Ms Mmatlala Rabothata
Designation: Environmental Officer: Environmental Impact Evaluation
Date: 20/06/2012

CC:	Mr Ryan Hammond	Solaire Direct Southern Africa	Fax: 021 685 9591
	Mr Cira Ngeetu	Eastern Cape DEDEA	Fax: 045 838 3931
	Mr Mzwandile Sydney Tantsi	Inxuba Yethemba Local Municipality	Fax: 048 881 1421

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A. EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES

1. General site information

The following general site information is required:

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

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

2. Site maps and GIS information

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

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map/layer must be provided that includes the following:
  - Current use of land on the site including:

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- Buildings and other structures
- Agricultural fields
- Grazing areas
- Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
- Critically endangered and endangered vegetation areas that occur on the site
- Bare areas which may be susceptible to soil erosion
- Cultural historical sites and elements

➢ Rivers, streams and water courses

➢ Ridgelines and 20m continuous contours with height references in the GIS database

➢ Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs

➢ High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries

➢ Buffer zones (also where it is dictated by elements outside the site):

- 500m from any irrigated agricultural land
- 1km from residential areas

➢ Indicate isolated residential, tourism facilities on or within 1km of the site

- A slope analysis map/layer that include the following slope ranges:

➢ Less than 8% slope

➢ between 8% and 12% slope

➢ between 12%and 14% slope

➢ steeper than 18 % slope

- A map/layer that indicate locations of birds and bats including roosting and foraging areas (specialist input required)
- A site development proposal map(s)/layer(s) that indicate:

➢ Positions of solar facilities

➢ Foundation footprint

➢ Permanent laydown area footprint

- Construction period laydown footprint
- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
- River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
- Substation(s) and/or transformer(s) sites including their entire footprint.
- Cable routes and trench dimensions (where they are not along internal roads)
- Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM)
- Cut and fill areas along roads and at substation/transformer sites indicating the expected volume of each cut and fill
- Borrow pits
- Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
- Buildings including accommodation

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

3. Regional map and GIS information

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

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - roads including their types (tarred or gravel) and category (national, provincial, local or private)
  - Railway lines and stations
  - Industrial areas
  - Harbours and airports
  - Electricity transmission and distribution lines and substations

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- Pipelines
- Waters sources to be utilised during the construction and operational phases
- A visibility assessment of the areas from where the facility will be visible
- Critical Biodiversity Areas and Ecological Support Areas
- Critically Endangered and Endangered vegetation areas
- Agricultural fields
- Irrigated areas
- An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams

4. Important stakeholders

Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Request for comment must be submitted to:

Mrs. Anneliza Collett
Directorate: Land Use & Soil Management
Department of Agriculture, Forestry & Fisheries
Tel: 012 - 319 7508
Fax: 012 - 329 5938
e-mail: AnnelizaC@nda.agric.za
www.agis.agric.za

In addition, comments must be requested from Eskom (Mr Kevin Leask or Mr Ronald Marais (011) 8008111) regarding grid connectivity and capacity.

B. AGRICULTURE STUDY REQUIREMENTS

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point

- Soil colour
- Limiting factors
- Clay content
- Slope of the site
- A detailed map indicating the locality of the soil forms within the specified area,
- Size of the site

- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)
- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map

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water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag x6041, Port Elizabeth 6000
Tel: 041 501 0717
Enquiries: M. Bloem
E-mail: bloemm@dwa.gov.za
Fax 086 560 5042
Ref: 90 MW Drennan PV

Solair Direct Drennan PV Power Facility
ERM South Africa (Pty) Ltd
Postnet Suite 90
Private Bag X12
Tokai
CAPE TOWN
7966

Attention Ms. T. Aspeling

PROPOSED 90 MW DRENNAN PHOTOVOLTAIC (PV) POWER FACILITY, EASTERN CAPE

This office acknowledges receipt of the Final Scoping Report for the above-mentioned project from Solaire Direct.

Comments from Water Quality Management

Concerns:

- The fact that the proposed development will take place in/near/over/through various water courses and resources.

Suggestion(s):

- Ensure that the proposed development adheres to all the conditions set forth in the National Water Act (Act 36 of 1998) and that all water uses are identified according to the National Water Act, 1998 (Act 36 of 1998).
- Ensure that effective stormwater management is addressed in a subsequent report.
- The fuel storage facilities should have a bunded wall around them with a volume greater than the capacity of the fuel storage tank, in order to contain any potential spill.
- None of the wash water used to clean the solar panels may enter into any water resource.
- Avoid construction within the drainage lines.

Register for:

No water uses need to be registered for sections 21 (e), (f) (g) or (h) in terms of the National Water Act (Act 36 of 1998).

Recommendations for the EIA process:

- State clearly where all the water for this development will be sourced from during every stage of the development.

Comments from Resource Protection

The proposed PV solar facility may affect watercourses in the area, namely Great Fish River, its tributary and drainage lines. In terms of Chapter 4 of the National Water Act, 1198 (Act No 36 of 1998) (the Act), any proposed development within the extent of a watercourse i.e. 1:100 year floodline or the delineated riparian habitat, whichever is the greatest constitutes a Section 21 water use.

Therefore, if the following activities will be within the extent of the watercourses:

- The placement of PV panels and module mountings
- Construction of a substation, on site buildings etc;
- Internal access roads, underground cabling and pylons; and
- Any other structure and / or infrastructure,

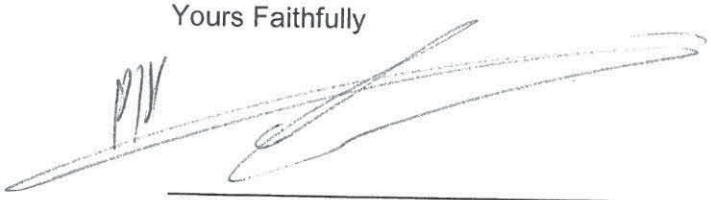
a water use authorization in terms of Section 21 (c) and (i) of the Act will be required for impeding or diverting the flow of water in a watercourse, and altering the bed, banks, course or characteristics of a watercourse, respectively.

If any of the above mentioned activities triggers a Section 21 (c) and (i) water use, the following information should be submitted as part of the application:

- Section 21 (c) and (i) forms (can be provided on request)
- Section 21 (c) and (i) Water Use Supplementary Information Questionnaire (can be provided on request)
- A master layout plan showing all the project's activities in relation to the delineated 1:100 year floodline for the affected watercourses and a legible 1:50 000 topographic locality map
- Stormwater Management Plan
- Rehabilitiation Plan for all the disturbed areas
- Monitoring Programme
- Method Statement
- Civil design drawings for the structures
- A technical report stipulating the Geotechnical and Geohydrological studies
- If any wetland will be affected, wetland delinieation and assessment with 500 m radius mapped around all wetlands should be conducted
- Impact / Risk Assessment of the water use activities on the watercourses; with specific reference to the following characteristics:
    - Flow regime
    - Water quality
    - Riparian Habitat (extent of clearing and disturbance)
    - Biota

Please do not hesitate to contact this office should you have any enquiries.

Yours Faithfully



CHIEF DIRECTOR: EASTERN CAPE

Date: 17/05/2013

SOLAIREDIRECT SOUTHERN AFRICA (Pty) Ltd
1st Floor, Birkdale 1
River Park
Gloucester Road
Mowbray, Cape Town
7530

Att: Reggie Niemand

RE: DRENNAN SOLAR PARK – Supply of Water for Construction Activities

Dear Sir,

I confirm that I am able to meet the water requirements for the construction and operation phase of your project, as per the volumes shown below (as provided by Solairedirect):

Construction phase (18 month period):
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 including construction-related water requirement approximately 9.6 million litres with an average daily usage of 17,777 litres and maximum of 60,000 litres per day. 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/m3 X 2,754m3). The estimated construction-related water requirement is 5.4 million litres. Temporary ablution facilities will be required during construction.

Operational phase:
It is estimated that PV panel cleaning will require a total of approximately 10,000 litres/MW/year). Therefore 750,000 litres per year. Over a 20 year period, 15000 m^3 of water will be required.
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.

Portion 15 of Portion 1, of the Farm WaaiPlaats (no. 550) at Drennan, Eastern Cape Provincecurrently has a water allocation of 10 000 cubic meters ~~per year~~ a/a, as per water use certificate reg. no. Boorgat, and has sufficient capacity to meet the needs of the solar project. The Drennansolar project will be located on a leasehold portion of the farm.

Yours Sincerely,

.....
Mr.Wentzel Lombard
26 June 2013

TRANSNET

31 July 2013

Dear Mr. W. Lombard

TRANSNET PROPERTY; NB1 – NB10 DRENNAN; RENTAL ALLOCATION

This letter serves to confirm that your application to rent the above properties was successful. The houses have been allocated to you as from 01 August 2013 for a period of eight months where after you will have the first option to renew the contract for a further period.

Your monthly commitments are as follows;

Rental 10 ×	R	10.00
SUB TOTAL	R	100.00
Deposit	R	100.00
TOTAL	**R**	**200.00**

The amount of R200.00 must be paid into Transnet's banking account before you can take residence of the property and the deposit slip or proof of payment is to be faxed/emailed to this office.

The banking details are as follows;

Bank	:	STANDARD BANK
Account name	:	TRANSNET PROPERTY
Account number	:	080 167 136
Branch code	:	050017
Reference	:	1079303

Payments of monthly rental can either be made directly to the above bank account or to our Rental Collection Agent in the area – **Almoray Myburg (073 785 8697).** Any maintenance issues can also be reported to her, who will in turn escalate it to the office.

Please complete page two and fax/email back to me on 086 653 6292 or Anja.Moller@transnet.net.

Kind Regards,

Möller

Anja Möller
Property Operations Supervisor
TRANSNET PROPERTY (PE)

TRANSNET

ACCEPTANCE OF ALLOCATED TRANSNET HOUSE

I, Wentzel Christoffel Lombard, ID 631118 5072 08 4, accept the allocated Transnet houses NB1 – NB10 Drennan wef 01 August 2013 and furthermore I undertake to pay the monthly commitments as set out above wef 01 August 2013.

Signed,

W.C. Lombard

Transnet SOC Ltd
Registration Number
1990/000900/30

Transnet Building
North Union Street
Port Elizabeth
6001

P.O. Box 23960
Port Elizabeth
South Africa, 6000
T +27 41 507 1300
F +27 41 507 2857

Directors: ME Mkwanazi (Chairman) B Molefe* (Group Chief Executive) NK Choubey# MA Fanucchi Y Forbes HD Gazendam NP Mnxasana N Moola NR Njeke IM Sharma IB Skosana F Tshabalala DLJ Tshepe A Singh* (Group Chief Financial Officer)
*Executive #Indian

Group Company Secretary: ANC Ceba

www.transnet.net

Annex F

Ecological and Biodiversity Specialist Report

DRENNAN SOLAR ENERGY FACILITY:

FAUNA & FLORA SPECIALIST REPORT FOR IMPACT ASSESSMENT

PRODUCED FOR ERM

ON BEHALF OF SOLAIREDIRECT

BY

SIMON TODD CONSULTING
Simon.Todd@3foxes.co.za

Revised June 2013

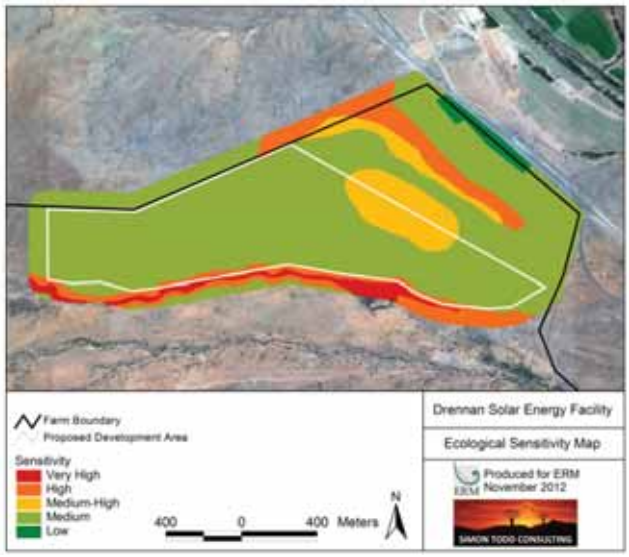
CONTENTS

EXECUTIVE SUMMARY

Solairedirect is proposing to develop a 40MW solar energy facility at Drennan, near the N10, approximately 30 km south of Cradock in the Eastern Cape Province. This report characterises the environment likely to be impacted by the development and details the terrestrial ecological impacts likely to be associated with the development of the solar energy facility at the site.

A review of the available literature and three site visits were conducted to assess the presence and distribution of ecologically sensitive species and habitats at the site. An ecological sensitivity map for the site was generated which is depicted below.

There were no highly sensitive features within the site which would need to be avoided. The southern boundary of the site is however formed by an ephemeral drainage line which should be delineated and buffered prior to construction to avoid impact to this sensitive area. The abundance of listed and protected species within the proposed development area is however high and many individuals of some species such as *Euphorbia globosa* would be impacted by the development of the site. The site is also within a Critical Biodiversity Area and the development of the site would potentially compromise the ecological functioning of the CBA.



In terms of the impacts that were identified as being associated with the development of the site the following impacts were identified and assessed:

- Impacts on vegetation and listed and protected plant species
- Increased alien plant invasion risk
- Increased erosion risk and negative hydrological impacts
- Direct and indirect faunal impacts
- Avifaunal Impacts
- Loss of landscape connectivity and loss of function of Critical Biodiversity Areas

The majority of impacts can reduced to a low level through avoiding the sensitive receptors and implementing relatively simple mitigation. As a result of the large amount of disturbance that is likely to accompany the construction phase of the project, the impacts on fauna and flora are likely to be of high intensity, but given their limited extent, these impacts are likely to be local in nature and not of broader significance. Although a large number of the *Euphorbia globosa* plants which is listed as Endangered were observed to occur within the development area, this species was common at the site outside of

the proposed development area as well and the development area occupies a small proportion of the local population of this species which would not be compromised by the development. Search and rescue prior to construction is recommended to translocate this as well as other suitable species outside the development footprint before construction. The risk of alien plant invasion is quite high given that a large number of alien species were recorded at the site and would quickly increase in disturbed areas after construction. The panels themselves and the hardened surfaces of the roads and other infrastructure are likely to generate a lot of runoff which will pose a high erosion risk if not properly managed. The site falls within a CBA that does not relate to a high known biodiversity at the site, but rather to a broad-scale corridor designed to maintain the connectivity of the landscape. Given the limited extent of the site in relation to the CBA, it is unlikely that the development of the site would compromise the overall functioning of the CBA.

Provided that the mitigation measures as suggested can be implemented, then the overall impact of the development would be of low significance and it is not likely that the development would result in an overall net loss of biodiversity or long-term degradation of the receiving environment.

Summary assessment of the pre- and post-mitigation impacts associated with the construction and operation phases of the project for the two development alternatives.

Impact	**Construction**		**Operation**	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Impacts on vegetation and listed or protected plant species	High	Moderate	Low	Low
Increased Alien Plant Invasion Risk	Medium	Low	Medium	Low
Increased Erosion Risk	Medium	Low	Medium	Low
Direct and Indirect Faunal impacts	Medium	Medium	Medium-Low	Low
Avifaunal Impacts	Medium	Low	Low	Low
Loss of landscape connectivity and impact on functioning of CBAs	Medium	Low	Medium	Medium-Low

DECLARATION OF CONSULTANTS INDEPENDENCE

- I *Simon Todd*, as the appointed independent specialist hereby declare that I:
- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference must be attached.

Simon Todd Pr.Sci.Nat 400425/11.

June 2013

1 INTRODUCTION

Solairedirect is proposing to develop a solar energy facility at Drennan, near the N10, approximately 30 km south of Cradock in the Eastern Cape Province. The development would have a maximum generation capacity of 40 MW and would be approximately 80 ha in extent. In terms of the EIA regulations, an Impact Assessment process is required before the development can proceed. To these ends, Environmental Resources Management (ERM) has appointed Simon Todd Consulting to perform a specialist fauna and flora assessment of the site as part of the EIA process. The purpose of this study is to characterise and describe the terrestrial environment, habitats and species present at the site and provide an assessment of the likely impacts of the development of a solar energy facility at the site.

The broad terms of reference for the assessment include the following:

- Assess and detail the potential impacts of the proposed development on both vegetation and fauna at the site
- Outline possible mitigation measures, rehabilitation procedures and or vegetation removal procedures that would reduce the potential impacts of the development.
- Identify and rate the significance of potential impacts and outline additional management guidelines.

The detailed terms of reference for the study are described below.

1.1 SCOPE OF STUDY

Vegetation Study

- Carry out fieldwork to locate and describe the current state of vegetation on the study area, key focus on the impact footprint(s) for site, so that there is a baseline description/status quo against which impacts can be identified and measured.
- Determine the species present and localities within each vegetation types.
- Generate a vegetation map showing the site in relation to any Critical Biodiversity Areas and links to ecological corridors and support areas, vegetation sensitivity, disturbed, transformed and potential “no-go” areas.
- Determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected.
- Provide site photos that show the current state of the vegetation (i.e. natural, transformed, disturbed etc.) Identify and describe the conservation value and conservation planning frameworks relevant to this site (Regional Planning) for represented vegetation units.
- A detailed list of species of special concern.
- An indication of the irreplaceability value of vegetation types present on site.
- Describe the areas where indigenous vegetation has been transformed.
- Determine alien species present; their distribution within the study area and recommended management actions.

- A description of different micro-habitats, and the species associated with those habitats.
- Note and record the position of unusually large specimens of trees.
- Describe the potential direct, indirect and cumulative negative and positive impacts of the proposed activity on vegetation species during the construction, operation and decommissioning phases of the project.
- Identification of issues and potential direct, indirect and cumulative biodiversity impacts, which are to be considered in combination with any additional relevant issues that may be raised through the public consultation process. These include:
    - The cumulative impact of clearing for the construction of solar facilities on floral species of concern both on the farm and in the greater area.
- Disclose any gaps in information or assumptions made.
- Recommendations for mitigatory measures to minimise impacts identified.
- An outline of additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP), as well as generic rehabilitation and re-vegetation guidelines.

Faunal Study

- Carry out fieldwork to describe and assesses the current state of terrestrial fauna in the area so that there is a baseline description/status quo against which impacts can be identified and measured.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Describe the different micro-habitats, and the species associated with those habitats.
- Describe the potential direct, indirect and cumulative negative and positive impacts of the proposed activity on inhabitant and reliant faunal species during the construction, operation and decommissioning phases of the project.
- Provide a detailed fauna sensitivity map of the site, including mapping of faunal community disturbance, transformation and potential “no-go” areas on site.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);
    - or, are of cultural significance.
- A description of species composition and conservation status in terms of protected, endangered or vulnerable faunal species.
    - This description will include species which are likely to occur within, traverse across or forage within the proposed project area, as well as species which may not necessarily occur on site, but which are likely to be impacted upon as a result of the proposed development.

- Identification of issues and potential direct, indirect and cumulative biodiversity impact which are to be considered in combination with any additional relevant issues that may be raised through the public consultation process. These include:
    - The cumulative impact of clearing for the construction of solar facilities on faunal species of concern both on the farm and in the greater area.

General Considerations:

- Disclose any gaps in information or assumptions made.
- Recommendations for mitigatory measures to minimise impacts identified.
- An outline of additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP) for faunal related issues.

A description of the potential impacts of the development and recommended mitigation measures are to be provided which will be separated into the following project phases:

- Pre-construction
- Construction
- Operational phases

2 REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

National Environmental Management Act (NEMA) (Act No 107, 1998):

NEMA requires that measures are taken that ”prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.” In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

Environment Conservation Act (ECA) (No 73 of 1989 Amendment Notice No. R1183 of 1997)

This Act provides for the effective protection and controlled utilisation of the environment. This Act has been largely repealed by NEMA, but certain provisions remain, in particular provisions relating to environmental impact assessments. The ECA requires that developers must undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations.

National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004):

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). These regulations deal with the hunting industry as well as any other activities which involve the cultivation, keeping or impacting listed species. A permit is required for any listed activities involving protected or endangered species. These permits are usually administered by the provincial authorities and may take the form of an Integrated Permit, which covers both the provincial and national TOPS requirements.

Apart from the TOPS regulations NEM:BA also provides for the regulation of certain activities, known as Restricted Activities. These activities may not proceed without environmental authorization. Those relevant to the current study are listed below.

Under the **Environmental Impact Assessment Regulations Listing Notice 1 of 2010** (No. R.544) the following activities are likely to be triggered:

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.

Under the **Environmental Impact Assessment Regulations Listing Notice 2 of 2010** (No. R.387) the following activities are likely to be triggered:

Activity 1: The construction of facilities or infrastructure, including associated structures or infrastructure, for -

(a) the generation of electricity where –

(i) the electricity output is 20 megawatts or more; or

(ii) the elements of the facility cover a combined area in excess of 1 hectare;

And, under **Environmental Impact Assessment Regulations Listing Notice 3** of 2010 (*R.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.

Activity 16 IV: The construction of infrastructure covering 10 square meters of more where such construction occurs within a watercourse of within 32 metres of a watercourse measured from the edge of the watercourse, excluding where such construction will occur behind the development setback line. Within:

It is important to note that the above thresholds and activities also apply to phased developments "*where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold."*

National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".*

No protected tree species were observed in the vicinity of the site and as the site outside of the drainage lines is quite open, it is relatively safe to conclude that no protected tree species occur within the affected area.

Conservation of Agricultural Resources Act (Act 43 of 1983):

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

Although several listed invasive species were observed at the site, such as *Salsola kali*, *Argemone ochroleuca* and *Xanthium strumarium*, the abundance and density of alien plants at the site was generally low. Alien species were largely associated with disturbed areas such as around watering points, and were not commonly observed in the open veld.

Eastern Cape Nature Conservation Act, 19 of 1974 and variously amended thereafter

The above act as well as the Transkei Decree (No 9 Of 1992) and the Ciskei Nature Conservation Act of 1987 are all applicable to the Eastern Cape. These acts make provision for the management of protected areas, as well as for regulations relating to the hunting of wild animals, catching of fish and the harvesting of plant species. Lists of protected plant and animal species are provided. Protected species include all frogs, tortoises and reptiles.

3 METHODOLOGY

3.1 DATA REVIEW & SOURCING

3.2 DATA SOURCING AND REVIEW

The data sources consulted and used where necessary in the study includes the following:

Flora & Ecosystem

- Vegetation types for the area were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006), while the conservation status of the affected vegetation types is from Mucina & Rutherford (2006) and the National List of Threatened Ecosystems (2011), as applicable.
- Information on plant and animal species recorded for the Quarter Degree Squares (QDS) 3225 BC and BD, DA, DB was extracted from the SABIF/SIBIS database hosted by SANBI. This is a significantly larger extent than the study area and the list would therefore contain a lot more

species than would actually occur at the site, but represents a necessarily cautious approach as the specific study site and its vicinity have probably not been well sampled in the past.

- The IUCN conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2012).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- The list of reptiles for the site was augmented by generating a list of species recorded for the area from the SARCA website http://vmus.adu.org.za.
- Bird data for the site was extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas was also consulted to ascertain if the site falls within the range of any range-restricted or globally threatened species. The *Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa* (Smit 2912), produced by Birdlife South Africa were also consulted for best-practice guidelines and suggested mitigation measures.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. For each species, the likelihood that it occurs at the site was rated according to the following scale:
    - **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
    - **Medium:** The habitat is broadly suitable or marginal and the species may occur at the site.
    - **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
    - **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site. No species are characterised as definitely present without a site visit.

General

- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2012) (See Table 1) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

Table 1. The IUCN Red List Categories for fauna and flora. Species which fall within the categories in red and orange below, are of conservation concern.

IUCN Red List Category
Critically Endangered (CR)
Endangered (EN)
Vulnerable (VU)
Near Threatened (NT)
Critically Rare
Rare
Declining
Data Deficient - Insufficient Information (DDD)
Data Deficient - Taxonomically Problematic (DDT)
Least Concern

3.3 Sampling Limitations and Assumptions

The site was visited on three separate occasions; with the result that the site has been well sampled and observed during different seasons. The list of plant species obtained for the site is therefore likely to be highly representative and it is not likely that there are any significant features of the site that were not observed. The list of plant species was however complemented by a list of any red-data species which are known from other studies to occur in the general vicinity of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes account of the study limitations.

3.4 Site Visit

The main site visit for the assessment took place on the 2nd of July 2012. A preliminary site visit to the area was also conducted in March 2012 and follow-up site visit in October 2012. The site has therefore

been visited in different seasons and it is not likely that there are many plant species present that were not observed. During the main site visit, the different biodiversity features, habitat, vegetation and landscape units present at the site were identified and mapped in the field. Walk-through-surveys were conducted across the site and all plant and animal species observed were recorded. Searches for listed and protected plant species at the site were conducted and the location of all listed plant species observed was recorded using a GPS. Active searches for reptiles and amphibians were also conducted within habitats likely to harbor or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

3.5 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases as described above. This includes delineating the different vegetation and habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, values and the potential presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved specifically for areas where the natural vegetation has already been transformed, usually for intensive agricultural purposes such as cropping. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is highly undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided at all costs.

3.6 RELEVANT ASPECTS OF THE DEVELOPMENT

A single site is being considered for the development. The site is 110 ha in extent and is located on the farm Drennan, approximately 30 km south of Cradock along the N10. The site is gently sloping and

consists of a dwarf shrubland with occasional scattered trees. Although there are no drainage lines within the site itself, the southern boundary of the site is delineated by an ephemeral drainage line which is a tributary of the Great Fish River which occurs about one kilometre to the east of the site. The site and the Drennan property are depicted in Figure 1 below.

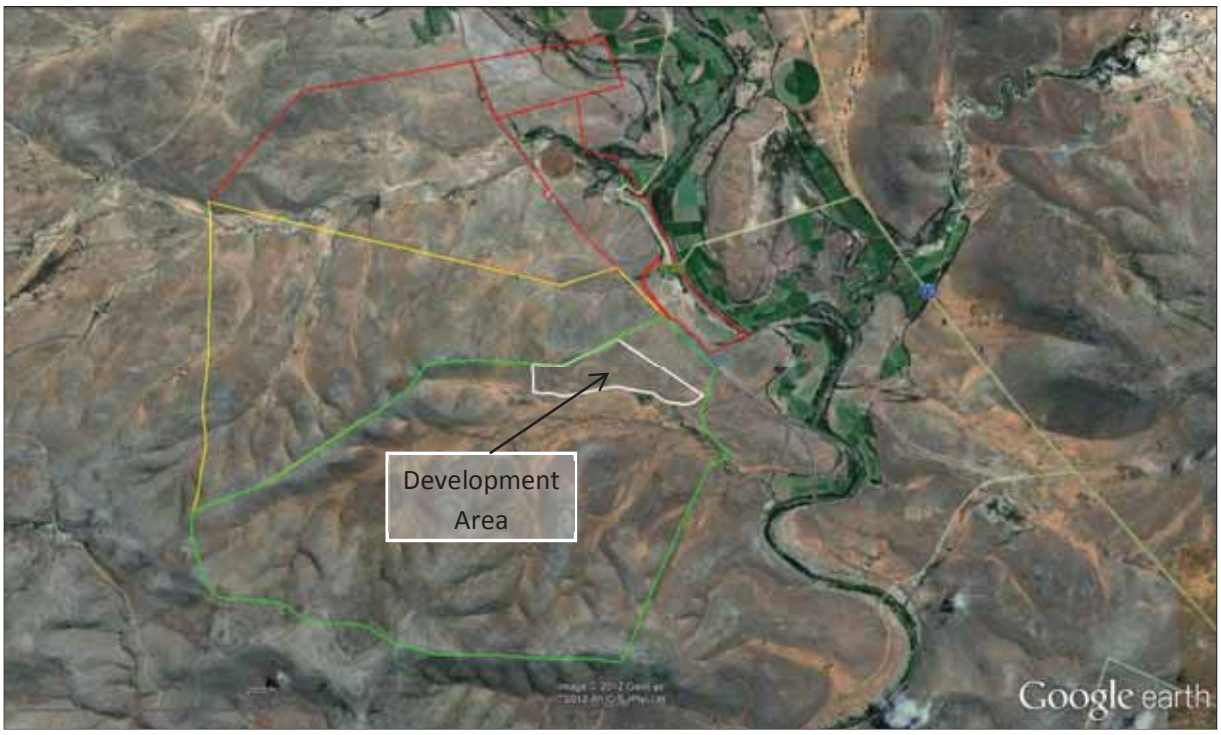


Figure 1. Satellite view of the Drennan site, illustrating the various cadastral units in the area and the proposed development area in white.

Important aspects of the construction and infrastructure of the development which are potentially relevant to assessing the likely impacts of the activities associated with the development include the following:

- Solar PV Arrays will be installed in rows at the site. They will be mounted on steel structures which will be piled or cemented into the ground depending on soil conditions
- Underground cabling will run the length of the arrays and will link the arrays to inverters.
- There will be two substations, an on-site substation (4000m^2) as well as a smaller "Loop-in Loop-out" grid connection substation (2500m^2), also located within the site.
- Service roads will run between the rows of arrays and will be used for maintenance activities such as cleaning the arrays.
- A 900m long and 6m wide access road is proposed which would access the site from the adjacent cadastral unit to the north.

Additional permanent infrastructure and temporary construction activities which will occur at the site will include:

- Auxilliary Electrical equipment
    - Diesel generator sets will supply power to security and monitoring systems in the event of a grid failure;
    - Security system, fence and access control;
    - Fire detection system;
    - Weather monitoring equipment (rainfall, wind speed/direction, solar irradiation, air moisture)
    - Plant monitoring equipment and associated telecommunication links;
    - Airconditioning equipment inside inverter/transformer enclosures which will regulate the operating temperature of the inverters;
- A small site office and storage facility, including security and ablution facilities
- Temporary construction camp
- A lay-down area (5000m^2) for the temporary storage of materials during the construction activities.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

4.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006), the site falls within the Eastern Upper Karoo vegetation type. There are a number of other vegetation types in the area, such as Southern Karoo Riviere and Great Fish Thicket, but these are associated with the riverine areas and adjacent hills respectively and do not occur within the study area. 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. Although, the southern boundary of the site is defined by a drainage line, there are no drainage lines or other wetland ecosystems within the site itself.

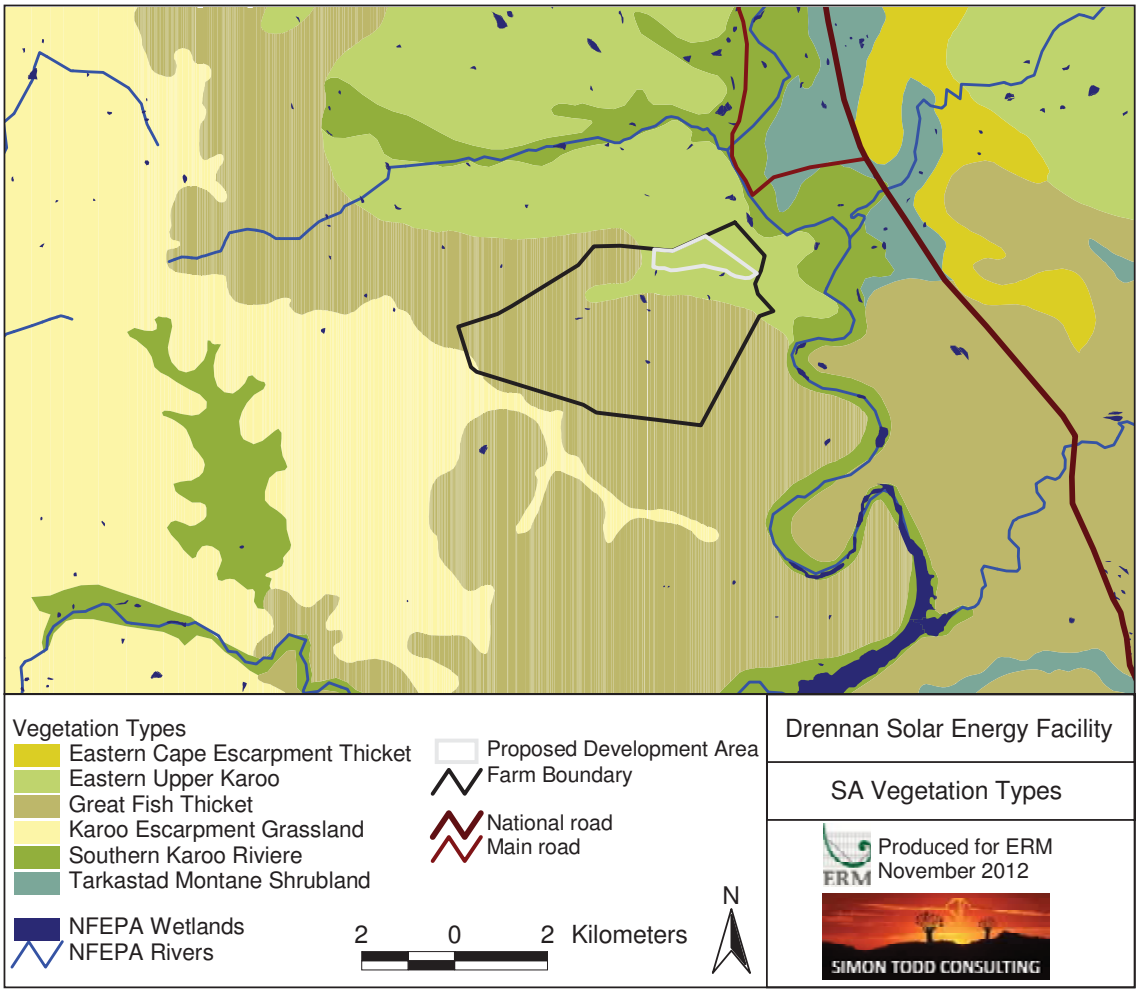


Figure 2. The broad-scale vegetation in and around the proposed Drennan Solar Energy Facility. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes rivers and wetlands delineated by the National Freshwater Ecosystem Priority Areas Assessment (Nel et al. 2011).

4.2 Fine-Scale Vegetation Patterns

At a broad scale, there are differences in vegetation structure and composition related to aspect, slope, soil depth and rock cover at the site. The most conspicuous differences are the drainage lines which are well wooded compared to the adjacent plains and the higher-lying slopes to the south and west of the site which also contain a greater bush cover as they consist of Great Fish Thicket. Within the proposed development area itself, the vegetation is however fairly homogenous and it was not possible to differentiate different plant communities within this area.

The vegetation within the proposed development area consists of a low mixed grassy shrubland with occasional trees or bush clumps. The dominant species within the shrub layer include *Pentzia incana,Rosenia glandulosa*, *Senecio acutifolius*, *Walafrida geniculata*, *Felicia muricata*, *Felicia filifolia*, *Asparagus striatus*, *Ruschia ferox* and *Eriocephalus ericoides* subsp. *ericoides*. Common and dominant grasses include *Enneapogon scoparius*, *Digitaria eriantha*, *Themeda triandra*, *Tragus koeleroides*, *Eragrostis obtusa*, *Fingerhutia africana* and *Aristida congesta*. Taller shrubs include *Rhigozum obovatum* and *Lycium oxycarpum*, while species associated with the bush clumps include *Carissa haematocarpa*, *Azimia tetracantha*, *Ehretia rigida*, *Mayteus heterophylla*, *Sanseveria aethiopica*, *Sarcostemma viminale* and *Haemanthus albiflos*. Trees include *Boscia oleiodes*, *Acacia karoo*, *Diospyros lycoides* and *Euclea undulata*. There are also a number of succulents and aloe species present such as *Aloe ferox*, *Aloe striata*, *Aloe grandidentata*, *Pachypodium succulentum*, *Astroloba* and *Haworthia*. The drainage lines were dominated by species such as *Acacia karoo*, *Diospyros lycoides* and *Lycium oxycarpum*. Although there were no large rocky outcrops within the site, there are some low rocky ledges and areas of exposed bedrock present which contain species such as

Figure 3. Two views of the proposed development area, in the left image, looking east over the site from near the center of the site and in the right image, looking west over the western third of the site. The images illustrate the relatively homogenous nature of the site and low and open stature of the vegetation with occasional trees of *Maytenus heterophylla* and *Euclea undulata* as in the left image or occasional aliens such as the *Opuntia ficus-indica* in the right image.

The site was relatively free of alien species. There were some alien plants around the watering points and other disturbed areas, but the veld was generally free of aliens. Exceptions to this pattern are *Opuntia ficus-indica* which occurred as scattered individuals and *Opuntica aurantica* which was common throughout the site but is less visible on account of its' low stature. *Opuntia aurantica* is however a serious weed and has sharp spines which catch onto anything which brushes the plant and spreads by means of the cladodes (succulent leaves) which easily break off when the plant is touched. Other alien

species which were observed at the site at low density or restricted to disturbed areas includes *Argemone ochroleuca*, *Conyza bonariensis*, *Salsola kali*, *Xanthium spinosum*, *Bidens pilosa*, *Cirsium vulgare* and *Tagetes minuta*.

Figure 4. *Opuntia aurantica* is common at the site and is a very troublesome species that is difficult to control as it spreads vegetatively as a result of sharp spines which catch passing animals, humans or vehicles and spread the leaves which break off easily.

4.3 LISTED PLANT SPECIES

A total of 174 plant species were observed at the site over the various site visits. This is a relatively high total given the limited extent of the site and reflects the high diversity of the area as well as the multiple site visits which have captured the majority of species present. According to the SANBI SIBIS database, 23 red-data listed species are known from the area (Table2, Table 3). Of these, three were confirmed as being present and a fourth red-data listed species, *Euphorbia globosa* which has not been recorded from the area before was also confirmed as being present. A number of the larger species can be confirmed as definitely not being present on account of the limited extent of the site and their conspicuous nature. The remaining species were not observed and although some of them may be present, this is not highly likely given the limited extent of the site and the multiple site visits that took place for the assessment. In terms of the abundance and significance of the red-data species present, *Aloe longistyla* was not common and the individuals observed were not within the development footprint. Boophone disticha was also not common but occurred scattered across the northern parts of the site where shallow rocky soils were present. Not many individuals of this species would be impacted and as this species is still very common across large parts of its range the potential loss of some individuals of this species would not have broader significance. *Drimia altissima* was fairly common along the ridge which defines the north-eastern boundary of the site. Affected individuals could potentially be translocated and as this species is still widespread and common in many areas, the impact on this species is not considered

highly significant. The presence of *Euphorbia globosa* at the site is potentially significant as this species has not been recorded from the area before. The nearest records are from Cradock and date from 1931. In addition it is known from only five remaining locations and is threatened by coastal development (SANBI 2012). Therefore the presence of this species at the site and the potential impact of the development on this species is potentially significant. However, Euphorbia globosa was observed to be abundant within the study area, especially on the hills to the north of the site. As such, the population extends well beyond the proposed development area and the areas where this species was observed to be most abundant are also outside of the proposed development area. As this species occurs on rocky slopes at the site, there do not appear to be any other major threats to this species and the local population is not in any immediate threat. The loss of some individuals from the development area would not compromise the viability of the local population of this species which very large and probably numbers many thousands of individuals, within the study area alone.

Euphorbia gobosa plant observed at the site. The density of these plants was quite high and it is likely that there are several thousand within the development footprint.

In addition to the red-data listed species a number of protected species were also confirmed as being present; this includes *Ammocharis coranica* as well as several aloe species such as *Aloe maculata A.striata* subsp. *striata*, *A.tenuior* and *A.variegata*. *Aloe ferox* was also present, but this is not a protected species. The abundance of the protected species was generally quite low except for Aloe tenuior which is a common species across most of the site and thousands of individuals would be impacted by the development.

Table 2. Summary of the conservation status of species known from the broad area surrounding the site. The presence of the listed species in the area does not imply that they occur at the site and the likely presence of the various listed species at the site is discussed in more detail below.

Status	No. Species
EN	1
VU	3
NT	3
Rare	5
Declining	7
DDD	3
DDT	6
LC	862
Grand Total	**890**

Table 4. Species known from the broad area around the site which are listed in the Red List of South African Plants (SANBI 2012). Four species are confirmed as being present at the site and at least 8 of the species can confirmed as definitely not being present. The remaining 11 species were not observed at the site and it is unlikely that they are present but the possibility cannot be entirely excluded on account of their smaller and cryptic nature.

Species	Status	Presence
Aloe longistyla	**DDD**	**Confirmed**
Pelargonium reniforme subsp. reniforme	DDD	Low Possibility
Salvia repens var. keiensis	DDD	Low Possibility
Boophone disticha	**Declining**	**Confirmed**
Cineraria lobata subsp. lobata	Declining	Low Possibility
Elaeodendron croceum	Declining	Not Present
Dioscorea elephantipes	Declining	Not Present
Pelargonium sidoides	Declining	Low Possibility
Drimia altissima	**Declining**	**Confirmed**
Rapanea melanophloeos	Declining	Not Present
Euphorbia globosa	**EN**	**Confirmed**
Protea lacticolor	EN	Not Present
Asparagus stipulaceus	NT	Not Present
Gnaphalium declinatum	NT	Low Possibility
Encephalartos lehmannii	NT	Not Present
Alepidea delicatula	Rare	Low Possibility
Gasteria baylissiana	Rare	Low Possibility
Kniphofia acraea	Rare	Not Present
Dierama grandiflorum	Rare	Low Possibility
Aloinopsis rubrolineata	Rare	Low Possibility
Alepidea macowani	VU	Low Possibility
Protea subvestita	VU	Not Present
Diascia ramosa	VU	Low Possibility

4.4 Critical Biodiversity Areas & Broad-Scale Processes

The site lies within the planning domain of the Eastern Cape Biodiversity Conservation Plan (Berliner & Desment 2007). This biodiversity assessment identifies Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives. The site falls within an extensive Tier 2 CBA which is intended to provide a corridor to maintain the connectivity of the landscape and enable fauna and flora to respond to global change. As such it is important to note that the site does not fall within a site that has been identified as being a hotspot of biodiversity for any

fauna or flora. Therefore, the major issue with regards to the development as it pertains to the CBA is the extent to which the development is likely to threaten or disrupt the connectivity of the landscape and hence compromise the ecological functioning of the CBA. From north to south the development is less than 1 km across, compared to the CBA which is about 25km. Therefore the extent of the development is small in comparison to the CBA and is highly unlikely that the development would pose a significant direct threat to the ecological functioning of the CBA. In addition, there are no specific attributes of the site which suggest that it would be especially important as a corridor for fauna or flora movement and migration. Therefore, the development would have a local impact on the CBA, but would not be likely to compromise the broad-scale ecological functioning of the CBA. The development of the site would however contribute to cumulative habitat loss and fragmentation in the area, with intensive agriculture being the primary source of habitat loss and transformation in the area.

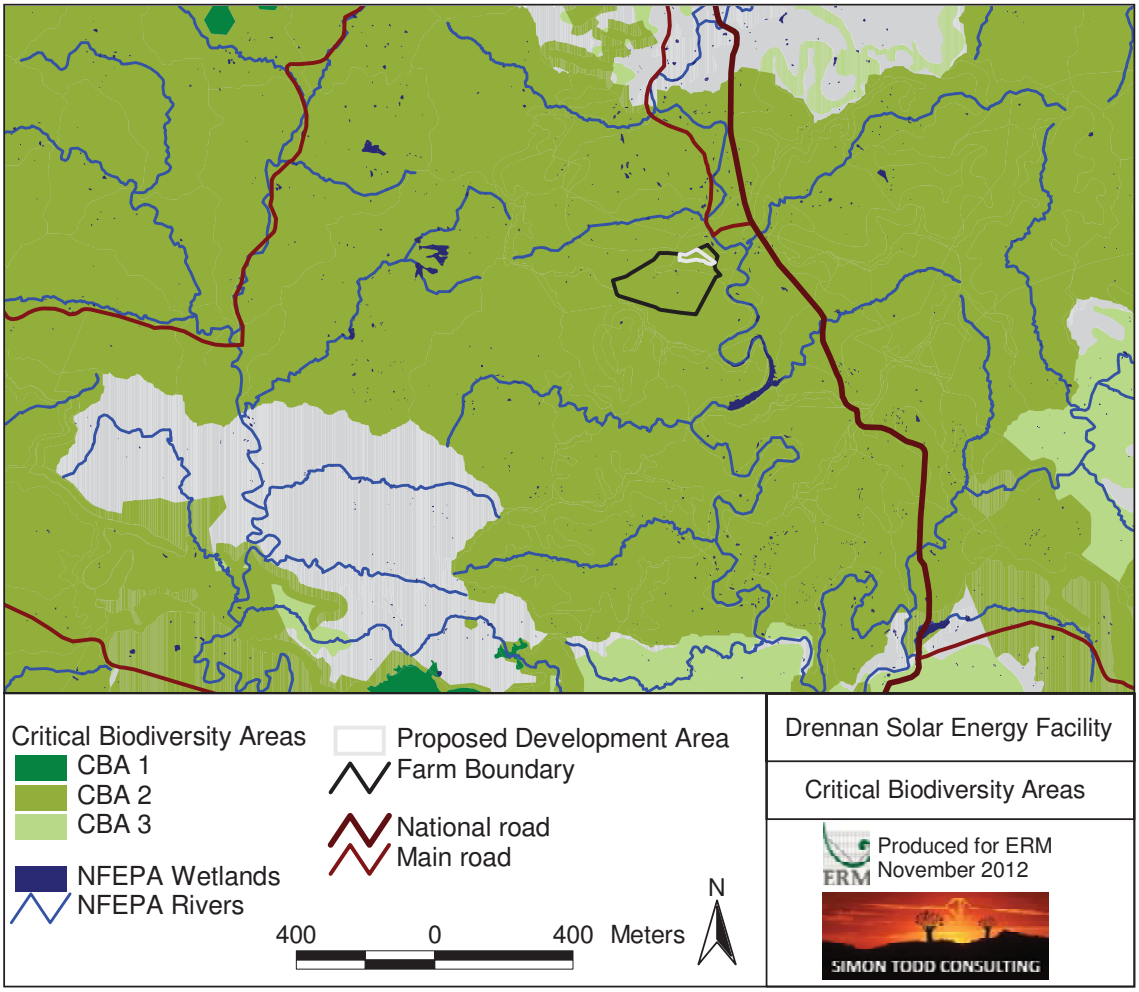


Figure 5. Critical Biodiversity Areas map for the area surrounding the site of the proposed Drennan Solar Facility. The site within a broad-scale corridor intended to maintain the connectivity of the landscape and enable fauna and flora to respond to global change.

4.5 FAUNAL COMMUNITIES

Mammals

The site falls within the distribution range of as many as 59 terrestrial mammals, indicating the mammalian diversity at the site is potentially high. Of these, five are listed, these are the Brown Hyaena *Hyaena brunnea* (Near Threatened), Black-footed cat *Felis nigripes* (Vulnerable), White-tailed Mouse *Mystromys albicaudatus* (Endangered), Ratel or Honey Badger *Mellivora capensis* (Endangered) and Leopard *Panthera pardus* (Near Threatened). It is unlikely that the Leopard and Brown Hyaena occur within the site given the open nature of the habitat and agricultural activity that takes place in the area. The habitat is however suitable for the Black-footed Cat which favours a mix of open and densely vegetated areas. However this species is widely distributed across the arid and semi-arid areas of South Africa, and the development would not amount to a significant amount of habitat loss for this species. The White-tailed Mouse is not highly likely to occur at the site as suitable refuges for this species, which likes to shelter down cracks in the soil, were not observed. This species is relatively widely distributed and there is little to suggest that the site would represent an area of above average significance for this species. It is quite likely that the Honey Badger occurs at the site, but the development is not likely to have a significant impact on local populations of this species as they are wide-ranging and the preferred development area is not within optimal habitat for this species. Mammals observed at the site include Bat-eared Fox *Otocyon megalotis*, Greater Kudu *Tragelaphus strepsiceros*, Springbok *Antidorcas marsupialis*, Steenbok *Raphicerus campestris*, South African Ground Squirrel *Xerus inauris*, Aardvark *Orycteropus afer*, Cape Porcupine *Hystrix africaeaustralis*, Yellow Mongoose *Cynictis penicillata* and Vervet Monkey *Cercopithecus mitis.*

In terms of bats, the site falls within the distribution range of Schreibers' long-fingered bat *Miniopterus schreibersii* which is listed as Near Threatened. However this species required caves for roosting and the nearest potential cave sites would be along the escarpment 20-30 km to the north of the site. This suggests that the site is not likely to be an important area for this bat species and the impact of the development on bats in general is likely to be low. A potential impact on bats via their food species would however result from lighting the site at night, which would attract insects and potentially bat species as well. Should the development require night-lighting, these should be of the low-UV emitting types, such as most LEDs, which attract significantly less insects.

The erection of fencing which prevents the movement of animals is a potential concern regarding the development of the site. However, the site occurs adjacent to the N10 as well as the railway line which are both already fenced on either side by restrictive mesh fencing. The fencing of the site is therefore not likely to contribute significantly to a reduction the connectivity of the landscape, which has already been impacted to some degree in that area.

Reptiles

The site lies in or near the distribution range of at least 35 reptile species (Appendix 3), indicating that the reptile diversity at the site is likely to be quite low. The diversity is habitats at the site is also quite low and there are no large rocky outcrops at the site which are an important reptile habitat. Based on distribution maps and habitat requirements, the composition of the reptile fauna is likely to comprise 1

terrapin, 1 tortoises, 17 snakes, 8 lizards and skinks, 7 geckos and 1 chameleon. No listed reptile species are known from the area. Species observed at the site include the Spotted Skaapsteker *Psammophylax rhombeatus*, Cape Skink *Mabuya capensis*, Spotted Sand Lizard *Pedioplanis lineoocellata* and Rock Monitor *Varanus albigularis*. Apart from a relatively small direct loss of habitat, the shading of the soil by the solar panels is likely to impact reptile composition in these areas, as the shading is likely to alter soil temperatures which has direct implications for cold-blooded animals. Most reptiles are also sensitive to the amount of plant cover which is also likely to be affected by the arrays. The presence of the arrays and electrical infrastructure would however create additional habitat for species which utilize such structures such as tubercled geckos (*Chondrodactylus* spp) and agamas (*Agama* spp).

Spotted Skaapsteker observed at the site while conducting reptile searches.

Amphibians

The site lies within the distribution range of 11 amphibian species. 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. Should this species occur in the area, it would be associated with pans or the floodplain environment. Given that the development area is not near to suitable pans, the potential impacts on this species would be low, as would impacts on the majority of other amphibians. Given the overall lack of specialized natural

amphibian habitats present within the development areas, amphibians are not likely to be highly sensitive to the development.

Avifauna

At least 238 bird species occur within the vicinity of the Drennan Solar Park site, including 12 listed species (Table 5). Although most of the listed species are uncommon in the area and not likely to occur at the site on a regular basis, a number of the species are common residents or regular visitors to the area and would be likely to occur at the site at least on occasion. Furthermore, most of the listed species are large raptors, cranes and bustards, which are all vulnerable to collisions with power line infrastructure. Any overhead lines required by the facility should therefore be fitted with bird flight diverters to ensure that they are more conspicuous and less likely to cause collisions and mortality of susceptible species. The extent of the development is relatively low and it is not likely that the development of the site would result in significant habitat loss for any of the listed species or any other bird species for that matter. The technical plan provided for the electrical connection indicates that the facility will connect directly via the Loop-in Loop-out substation on the site to the Eskom 400kV line which form the eastern boundary of the site. Therefore, the length of the new lines would be minimal and the risk from collisions similarly reduced. Therefore it is not likely that the grid connection would generate a significant impact on any listed species. However in order to reduce electrocution risk, the on-site electrical infrastructure should conform to best-practice guidelines in this regard to ensure a bird-friendly configuration and adequate insulation (Lehman et al. 2007). In addition the *Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa* (Smit 2012), produced by Birdlife South Africa are also referred to for best-practice guidelines regarding bird mitigation measures during the construction of the facility.

Table 5. Listed bird species known from the vicinity of the Drennan Solar Park site, including an evaluation of their frequency in the area, based on their reporting rate within SABAP.

Species	Status	Frequency
Black Stork	NT	Very Rare
Secretarybird	NT	Occasional
Cape Vulture (Griffon)	VU	Very Rare
Tawny Eagle	VU	Very Rare
Martial Eagle	VU	Occasional
Black Harrier	NT	Rare
Lanner Falcon	NT	Very Rare
Lesser Kestrel	VU	Regular
Blue Crane	VU	Regular
Denham's (Stanley's) Bustard	VU	Rare

Ludwig's Bustard	VU	Rare
Melodious (Latakoo) Lark	NT	Very Rare

4.6 SITE SENSITIVITY ASSESSMENT

The proposed development area is relatively homogenous and there are no specific features within the proposed development area that would need to be avoided. The upper part of the site towards the crest of the ridge is classified as higher sensitivity than the rest of the site on account of the greater plant species richness of this area and the greater abundance of red-listed plant species such as *Drimia altissima* and *Euphorbia globosa*. The southern boundary of the site is formed by a drainage line and this feature should be appropriately delineated and buffered from the development. Although the regulations stipulate that development should not take place within 32m of drainage lines without a permit, 50m would be a more appropriate buffer under the current circumstances. The presence of a relatively large number of red-listed and protected species at the site is the major characteristic feature of the site. Although the development will inevitably result in some loss of habitat for such species, the loss of individuals can to some extent be mitigated by translocating affected plants outside of the development footprint. This would however not be practical for some species such as *Euphorbia globosa* which are small and numerous and as some *Euphorbia* species do not transplant well, survival may also be very low if this was attempted.

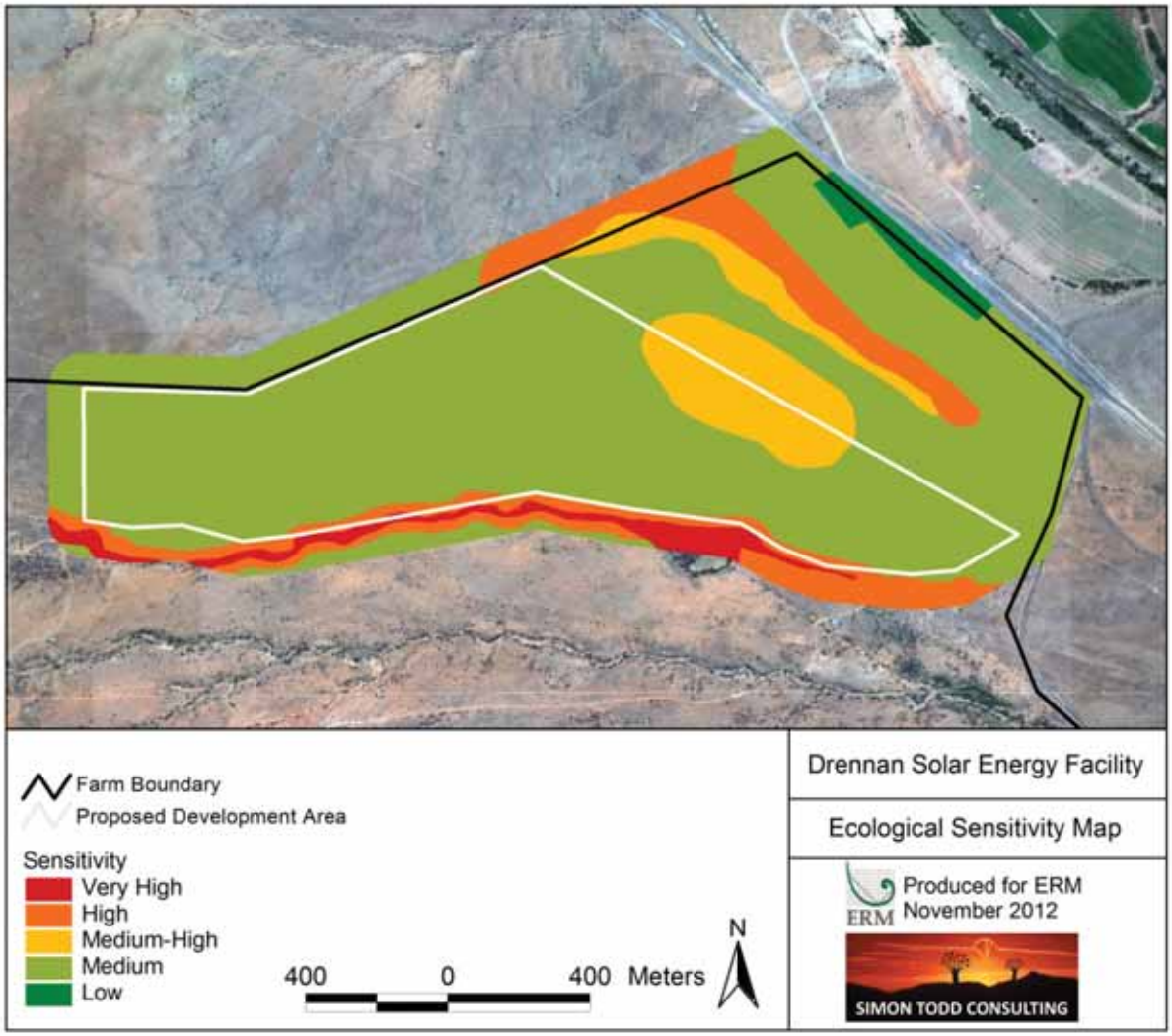


Figure 5. Ecological Sensitivity map of the proposed Drennan Solar Energy Facility site, illustrating the proposed development area

5 IMPACT ASSESSMENT

5.1 ASSESSMENT & SIGNIFICANCE CRITERIA

The assessment criteria used in the assessment are described below and are drawn from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989 as well as Brownlie (2005).

For each impact the following are described:

Nature of the impact. A description of positive or negative effect of the project on the affected environment, or *vice versa*. The description includes who or what would be affected, and how.

Extent of the impact. This includes assessing the spatial scale of the impact using the following scale:

- **On-site** – impacts that are limited to the site boundaries.
- **Local** – impacts that affect an area in a radius of 5 km around the site.
- **Regional** – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.
- **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 of the impact. The lifespan of the impact is assessed as follows:

- **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 (eg. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.

Certain impacts can also be *discontinuous or intermittent* (where the impact may only occur during specific climatic conditions or during a particular season of the year).

Intensity or magnitude of the impact. The intensity or severity of the impact would be indicated as either

- **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.

Potential for impact on irreplaceable resources. This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by reseeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems

substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. red data species that are restricted to a particular site or habitat of very limited extent.

Probability of occurrence. The likelihood of the impact actually occurring would be indicated as either Improbable (the possibility of the impact materialising is very low as a result of design or historic experience), Probable (there is a distinct possibility that the impact will occur), Highly probable (it is most likely that the impact will occur), or Definite (the impact will occur regardless of the implementation of any prevention measures).

Significance of the impact. Based on a synthesis of the information contained in the criteria above, the potential impact would then be described according to following significance criteria:

- **No significance**: the impacts do not influence the proposed development and/or environment in any way.
- **Low significance**: the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.
- **Moderate significance**: the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
- **High significance**: the impacts will have a major influence on the proposed development and/or environment and will result in the "no-go" option on the development or portions of the development regardless of any mitigation measures that could be implemented. This level of significance must be well motivated.

SIGNIFICANCE RATING

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

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

Significance Definitions	
Negligible significance	*An impact of negligible significance is where the magnitude is negligible, low or medium and the likelihood of the impact occurring is unlikely or likely.* 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 where the magnitude of the impact is low but the likelihood is high or where the magnitude is high but the likelihood of occurrence is unlikely or likely.* 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 where the magnitude is medium to high and the likelihood of the impact occurring is likely or definite.* 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 moderate impacts are being managed effectively and efficiently.
Major significance	*An impact of major significance is where the magnitude of the impact is medium to high and the likelihood of the impact occurring is also likely or definite.* 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.

Confidence The level of confidence in predicting the impact can be described as:

- **low**, where there is little confidence in the prediction, due to inherent uncertainty about the likely response of the receiving ecosystem, or inadequate information;
- **medium**, where there is a moderate level of confidence in the prediction;
- or **high**, where the impact can be predicted with a high level of confidence.

Cumulative Impact

Consideration is given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts are evaluated with an assessment of similar developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

Mitigation

The objective of mitigation is to firstly avoid and minimise impacts where possible and where these cannot be completely avoided, to compensate for the negative impacts of the development on vegetation and animal habitats and to maximise re-vegetation and rehabilitation of disturbed areas. For each impact identified, appropriate mitigation measures to reduce or otherwise avoid the potential impacts are suggested. All impacts are assessed without mitigation and with the mitigation measures as suggested appropriately implemented.

In order to ensure that impacts are avoided as far as possible and to implement effective mitigation at the site, the following mitigation hierarchy is used to prioritise mitigation actions:

- ***Avoidance***: Avoiding or reducing at source is essentially 'designing' the project so that a feature causing an impact is designed out (eg a waste stream is eliminated) or altered (eg reduced waste volume). Often called minimisation (most preferred)
- ***Reduction***: impact is reduced in magnitude and/or significance
- ***Abate on Site***
- **This involves adding something to the basic design to abate the impact - pollution controls**
- **fall within this category. Often called 'end-of-pipe'.**
- ***Rectification***: impact is mitigated after it has occurred e.g. rehabilitation of areas disturbed by construction
- ***Compensation***: providing a substitute resource for a resource that has been lost because of the project (e.g. "*conservation offsets*")
- ***No action (least preferred)***

5.2 IDENTIFICATION & NATURE OF IMPACTS

5.2.1 Impact Risk Factors

Potential ecological impacts resulting from the development would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase

- Vegetation clearing for PV arrays, lay down areas, roads, buildings etc could impact listed plant species as well as sensitive ecosystems. Vegetation clearing will also lead to increased erosion risk and amount to habitat loss for fauna.
- Operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site. Slow moving fauna would also not be able to escape construction vehicles quickly enough and would be killed.
- Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as runaway fires.

Operational Phase

- The operation of the facility will generate noise and disturbance which may deter some fauna from the site as well as impact the activities of others within the site.
- The presence of electricity transmission lines could lead to electrocution and collision of susceptible avifauna.
- Maintenance activities such as vegetation clearing will impact the biodiversity of the site if not conducted in a sensitive manner.
- Loss of connectivity & habitat fragmentation may result if fauna avoid the area or cannot move through the area on account of the presence of the facility.

5.2.2 Identified Impacts

The above risk factors are likely to be manifested as the following impacts:

Impacts on vegetation and listed or protected plant species

Some loss of vegetation is an inevitable consequence of the development and some individuals of protected or red-data listed species will also be impacted. As the abundance of some species such as *Euphorbia globosa* are high, impacts on such species is potentially high and the habitat loss for such species cannot be mitigated.

Increased Alien Plant Invasion Risk

Disturbance created at the site during construction would leave the site vulnerable to alien plant invasion. There are quite a large number of alien species present at the site and these species would quickly take advantage of the disturbance created by the construction activities, which would have negative consequences for biodiversity.

Increased Erosion Risk and Hydrological Impact

Increased erosion risk would result from soil disturbance and the loss of plant cover within cleared and disturbed areas. The majority of the site is gently sloping and the additional runoff generated by the panels and other cleared or hardened areas of the site would pose a significant erosion risk if not properly managed.

Direct and Indirect Faunal impacts

The construction of the facility will result in habitat loss for resident fauna, while increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Avifaunal impacts

Direct and indirect impacts of the development on avifauna would result from habitat loss as well as electrocution and collisions with transmission lines, which is a particular problem for many larger birds such as eagles, flamingos, cranes and bustards. However, given the proximity of the site to the ESKOM transmission line, the required overhead lines are of minimal length and the their anticipated impact similarly low.

Loss of landscape connectivity and loss of function of Critical Biodiversity Areas

The presence of the facility could potentially contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. Depending on how the development was fenced off, the fencing would probably also restrict animal movement and disrupt the connectivity of the landscape for fauna which would no longer be able to pass through the area. The impact of the development on Critical Biodiversity Areas is also considered under this impact as the CBA in the area is designed as a corridor for fauna and flora movement and migration.

5.3 ASSESSMENT OF IMPACTS

The six major impacts identified above are assessed below, during the construction and operational phases of the project as well as before and after mitigation. The development is assessed as a whole

and the different elements such as the roads, power lines and PV area are not assessed separately as they are not independent elements. Specific mitigation measures are however directed at the different components and activities associated with the development.

5.3.1 Construction Phase

Impact 1: *Impacts on vegetation and listed plant species*

Impact Nature: Site preparation and construction will result in a lot of disturbance and the loss of currently intact vegetation and loss of individuals of red-listed plant species.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**High**	**Low**	**High**	**Definite**	**High**	**High**
With Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Low**	**Moderate**	**Definite**	**Moderate**	**High**

Mitigation Description:

- The drainage line along the southern boundary of the site should be clearly demarcated as a no-go area with construction tape or similar method.
- Vegetation clearing to be kept to a minimum. The vegetation of the site is largely low and open and therefore whole-sale vegetation clearing should only be applied where necessary and within the development footprint.
- Where roads and other infrastructure cross sensitive features such as drainage lines, caution should be exercised to ensure that impact to these features is minimised.
- The final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction.

Residual Impact: The loss of some red-listed plant species from the site cannot be fully mitigated as the habitat loss is permanent and it is not likely that all the individuals of listed species can be translocated.

Cumulative Impact: The development would contribute to cumulative habitat loss and the disruption of landscape connectivity within the area. However, as the affected vegetation types are still largely intact, the impact would be largely local in nature.

Impact 2: *Increased alien plant invasion risk*

Impact Nature: Site preparation and construction will result in a lot of soil disturbance which will leave the site vulnerable to alien plant invasion

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Moderate**	**Moderate**	**Probable**	**Moderate**	**High**
With Mitigation	**Negative**	**Local**	**Short-term**	**Low**	**High**	**Low**	**Probable**	**Low**	**High**

Mitigation Description:

- Cleared areas which are not surfaced or required for construction should be revegetated with seed or plants of locally occurring species.
- Regular monitoring for alien plants within the development footprint during construction.
- No muddy and dirty equipment should be brought onto site as this is likely to carry seed of alien species.
- If sand or other natural materials for building are required and brought onto site, the stored heaps should be monitored for the growth and germination and alien species and should be regularly cleared during construction.

Residual Impact: If regular alien control is exercised, there will be no residual impact from alien species presence.

Cumulative Impact: Provided that alien species are controlled, there will be minimal cumulative impact from alien species. If alien species are not adequately controlled, then the invasion of the site would contribute to habitat degradation in the area.

Impact 3: *Increased soil erosion risk and impact on hydrological processes*

Impact Nature: Site preparation and construction will result in a lot of soil disturbance which will leave the site vulnerable erosion which result in topsoil loss as well as impact to adjacent riparian areas and changes to hydrological processes.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Low**	**Moderate**	**Probable**	**Moderate**	**High**
With Mitigation	**Negative**	**Local**	**Short-term**	**Low**	**High**	**Low**	**Improbable**	**Low**	**High**

Mitigation Description:

- Cleared areas which are not surfaced or required for construction should be revegetated with seed or

plants of locally occurring species.

- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion during construction to ensure that no erosion problems have developing as result of the construction disturbance.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.

Residual Impact: If regular erosion control is exercised, there will be little or no residual impact from erosion.

Cumulative Impact: Provided that erosion is effectively controlled, there would be minimal cumulative impact from erosion. If erosion is not adequately controlled, then erosion would contribute to the degradation of pans and wetlands in the area.

Impact 4: *Negative impact on fauna*

Impact Nature: Construction activities such as the operation of heavy machinery and the presence of construction personnel at the site will result in direct and indirect impacts on terrestrial fauna at the site.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Short-term**	**High**	**Medium**	**Low**	**Probable**	**Medium**	**High**
With Mitigation	**Negative**	**Local**	**Short-term**	**Medium**	**Medium**	**Low**	**Probable**	**Medium**	**High**

Mitigation Description:

- All construction staff should undergo an environmental induction from the ECO or other suitably qualified persons.
- Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
- No fires should be allowed on site.
- No fuelwood collection should be allowed on-site.
- No dogs should be allowed on site.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- No unauthorized persons should be allowed onto the site.
- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible

species such as snakes and tortoises. • All construction vehicles to remain on demarcated roads and access routes.
Residual Impact: Not all faunal impacts can be mitigated and there will be some residual impact resulting from noise, disturbance and mortality of species unable to flee the construction activities.
Cumulative Impact: The primary avenue for cumulative impact will be through cumulative habitat loss and the disruption of landscape connectivity. Direct impacts on fauna during construction will be transient and will not generate significant long-term cumulative impact.

Impact 5: *Negative impact on avifauna*

Impact Nature: Construction activities such as the operation of heavy machinery, and the presence of construction personnel at the site will deter many bird species from the area and disrupt the breeding of sensitive species or those breeding within the development area.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Short-term**	**Medium**	**Medium**	**Low**	**Probable**	**Medium**	**High**
With Mitigation	**Negative**	**Local**	**Short-term**	**Low**	**Medium**	**Low**	**Probable**	**Low**	**High**

Mitigation Description:

- The length of any new power lines that need to be installed should be kept to a minimum.
- Ensure that all new lines are marked with bird flight diverters along their entire length.
- All new power line infrastructure should be bird-friendly in configuration and adequately insulated (Lehman et al. 2007). These activities should be supervised by someone with experience in this field.
- The nest sites of any raptors observed breeding at the site should be avoided and buffered during construction.
- The *Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa* (Smit 2012), produced by Birdlife South Africa are also referred to for best-practice guidelines regarding bird mitigation measures during the construction of the facility.

Residual Impact: Not all avifaunal impacts can be mitigated and many birds especially larger species such as raptors, cranes and bustards are likely to avoid the area during construction.

Cumulative Impact: During the construction phase the activity at the site will contribute towards disturbance of avifauna in the area. The construction phase will however be transient and no long-term cumulative impacts are likely to be generated by the construction activities themselves.

Impact 6: *Disruption of landscape connectivity and loss of function of Critical Biodiversity Areas*

Impact Nature: Construction activities such as the operation of heavy machinery, and the presence of construction personnel at the site will generate a lot of noise and disturbance which will deter many species from the area and reduce the connectivity of the landscape for fauna as well as impact the ecological functioning of the CBA.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Medium**	**High**	**Probable**	**Medium**	**High**
With Mitigation	**Negative**	**Local**	**Long-term**	**Low**	**Medium**	**Low**	**Probable**	**Low**	**High**

Mitigation Description:

- The drainage line should be demarcated prior to construction and should be buffered by at least 50m from the edge of the demarcated area.
- The development footprint should be kept as small as possible and natural strips of vegetation should be allowed to persist between the rows of arrays.
- Fauna outside the construction area should not be disturbed.
- If the site must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.

Residual Impact: The construction phase of the facility will result in some residual impact on the connectivity of the landscape as fauna are likely to avoid the area regardless on account of the large amount of noise and activity that will be associated with this phase of the development.

Cumulative Impact: During the construction phase the activity at the site will contribute towards cumulative disturbance of fauna in the area. The construction phase will however be transient and no long-term cumulative impacts are likely to be generated by the construction activities themselves.

5.3.2 Operational Phase

Impact 1: *Impacts on vegetation and listed plant species*

Impact Nature: Site maintenance activities could impact intact vegetation and result in degradation of vegetation within the facility.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Low**	**Low**	**Probable**	**Low**	**High**

With Mitigation	**Negative**	**Local**	**Long-term**	**Low**	**Low**	**Low**	**Probable**	**Low**	**High**

Mitigation Description:

- Any vegetation clearing that needs to take place as part of maintenance activities, should be done in an environmentally friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.
- Precautions should be taken to prevent the spread of fire onto or off the site.

Residual Impact: The facility itself will occupy space and result in the long-term loss of vegetation and habitat. This would be primarily local in extent and is not likely to be highly significant.

Cumulative Impact: The development would contribute to cumulative habitat loss within the area. The major other source of habitat loss is intensive agriculture along the Great Fish River. The contribution of the facility to cumulative impact would however be relatively low as the extent of the facility is small in relation to the extent of habitat loss resulting from agriculture.

Impact 2: *Increased alien plant invasion risk*

Impact Nature: Disturbance created during the construction phase will leave the site vulnerable to alien plant invasion for some years into the operational phase of the development. In addition, the higher runoff likely to be generated by the facility may encourage alien plant invasion.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Medium**	**Medium**	**Probable**	**Medium**	**High**
With Mitigation	**Negative**	**Local**	**Medium-term**	**Low**	**High**	**Low**	**Probable**	**Low**	**High**

Mitigation Description:

- Regular monitoring for alien plants within the development area during operation.
- All alien plants present at the site should be controlled at least biannually using the best practice methods for the species present.
- Bare soil should be kept to a minimum, and a ground layer of grass or low shrub cover should be encouraged under the panels.

Residual Impact: If regular alien control is exercised, there will be no residual impact from alien species presence.

Cumulative Impact: Provided that alien species are controlled, there will be minimal cumulative impact from alien species. If alien species are not adequately controlled, then the invasion of the site would contribute to habitat degradation in the area.

Impact 3: *Increased soil erosion risk and hydrological impact*

Impact Nature: Disturbance created during the construction phase will leave the site vulnerable to erosion for some years into the operational phase of the development. In addition, the panels and other hardened surfaces of the site will generate a lot of runoff that may be cause erosion if not properly regulated.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Low**	**High**	**Probable**	**Medium**	**High**
With Mitigation	**Negative**	**Local**	**Short-term**	**Low**	**Moderate**	**Low**	**Improbable**	**Low**	**High**

Mitigation Description:

- Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All maintenance vehicles to remain on the demarcated roads.

Residual Impact: If regular erosion control is exercised, there will be little or no residual impact from erosion.

Cumulative Impact: Provided that erosion is effectively controlled, there would be minimal cumulative impact from erosion. If erosion is not adequately controlled, then erosion would contribute to the degradation of pans and wetlands in the area.

Impact 4: *Negative impact on fauna*

Impact Nature: The presence of the facility will impact fauna as the habitat will no longer be available and maintenance and operational activities may disturb fauna in the area.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Regional**	**Long-term**	**Medium**	**High**	**Low**	**Probable**	**Medium-Low**	**High**
With Mitigation	**Negative**	**Local**	**Medium-term**	**Low**	**High**	**Low**	**Probable**	**Low**	**High**

Mitigation Description:

- Access to the site should be restricted and only permitted staff and maintenance crews allowed on-site.

- No access should be allowed onto the site at night.
- Any fauna encountered during maintenance activities should be allowed to move off on their own. Tortoises and other slow-moving animals can be carefully moved to a sheltered site out of the way.
- If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All maintenance vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden and signs stating this should be placed at the access points to the site.
- No fires should be allowed on site.
- No fuelwood collection should be allowed on-site.
- No dogs should be allowed on site.

Residual Impact: The habitat loss resulting from the presence of the facility cannot be mitigated, but given the relatively limited extent of the development, this is not likely to be of broader significance.

Cumulative Impact: The presence of the facility will contribute to cumulative habitat loss in the area. Although there is some mining activity in the area, the broader area has not been heavily impacted by transformation and the overall contribution of the facility to cumulative habitat loss is likely to be low.

Impact 5: *Negative impact on avifauna*

Impact Nature: The presence of the facility will constitute habitat loss for resident species, while the presence of overhead power lines will also pose a risk of collisions and electrocution for susceptible species.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Low**	**Medium**	**Low**	**Probable**	**Low**	**High**
With Mitigation	**Negative**	**Local**	**Medium-term**	**Low**	**High**	**Low**	**Improbable**	**Low**	**High**

Mitigation Description:

- Adhere to the Birdlife South Africa guidelines for solar energy with regard to minimising the impacts of the facility on avifauna.
- Ensure that any maintenance on the transmission infrastructure of the site retains the bird-friendly design features.

- Any electrocution and collision events that occur should be recorded, including the species affected and the date. If repeated collisions occur within the same area, then further mitigation and avoidance measures may need to be implemented.

Residual Impact: Some habitat loss will result from the development that cannot be mitigated.

Cumulative Impact: The development will contribute a small amount to cumulative habitat loss in the area.

Impact 6: *Disruption of landscape connectivity and loss of function of Critical Biodiversity Areas*

Impact Nature: The presence of the facility and the alterations to the habitat will disrupt the connectivity of the landscape for some fauna which will avoid passing through the area as well as impact the ecological functioning of the CBA.

Impact	*Nature*	*Extent*	*Duration*	*Intensity*	*Reversibility*	*Impact on Irreplaceable Resources*	*Probability*	*Significance*	*Confidence*
Without Mitigation	**Negative**	**Local**	**Long-term**	**Medium**	**Low**	**Medium**	**Probable**	**Medium**	**High**
With Mitigation	**Negative**	**Local**	**Medium-term**	**Low**	**Medium**	**Low**	**Probable**	**Medium-Low**	**High**

Mitigation Description:

- Recovery of the ground layer between and underneath the rows of arrays should be encouraged.
- If the facility is going to be fenced-off, this should be in a manner which does not pose a threat to fauna, and as such no electrical stands should be placed within 30cm of the ground.
- If the construction area or camp must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.

Residual Impact: The disruption of landscape connectivity can only be partly mitigated and some fauna will avoid the area on account of the presence of the facility. However, the extent of the site is relatively limited and species which avoid the facility are also likely to be those large enough to move around it.

Cumulative Impact: The development will contribute to cumulative habitat disruption in the area. The contribution of the current development to the disruption of landscape connectivity is however likely to be fairly low on account of the relatively limited extent of the development in contrast to the largely intact nature of the surrounding landscape.

5.4 Summary Assessment

A summary assessment of the above impacts is provided below with reference to the different phases of the project (construction & operation) as well as pre- and post-mitigation. The majority of impacts can reduced to a low level through avoiding the sensitive receptors and implementing relatively simple

mitigation. Faunal disturbance and the loss of vegetation are an inevitable consequence of the development and result from the construction, operation and presence of the facility. As a result of the large amount of disturbance that is likely to accompany the construction phase of the project, the impacts on fauna and flora are likely to be of high intensity, but given their limited extent, these impacts are likely to be local in nature and not of broader significance. The risk of alien plant invasion is quite high given that a large number of alien species were recorded at the site and would quickly increase in disturbed areas after construction. The site is gently sloping and particularly lower down the slope, the soils are deeper and vulnerable to erosion. The panels themselves and the hardened surfaces of the roads and other infrastructure are likely to generate a lot of runoff which will pose a high erosion risk if not properly managed. The impact of the development on the CBA is a potential concern. The CBA does not relate to a high known biodiversity at the site, but rather to a broad-scale corridor designed to maintain the connectivity of the landscape. The extent of the site is however relatively small in relation to the CBA and it is unlikely that the development of the site would compromise the overall functioning of the CBA.

Table 2. Summary assessment of the pre- and post-mitigation impacts associated with the construction and operation phases of the project, under the two development alternatives.

Impact	**Construction**		**Operation**	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Impacts on vegetation and listed or protected plant species	High	Moderate	Low	Low
Increased Alien Plant Invasion Risk	Medium	Low	Medium	Low
Increased Erosion Risk	Medium	Low	Medium	Low
Direct and Indirect Faunal impacts	Medium	Medium	Medium-Low	Low
Avifaunal Impacts	Medium	Low	Medium	Low
Loss of landscape connectivity and disruption of broad-scale ecological processes	Medium	Low	Medium	Medium-Low

5.5 CUMULATIVE IMPACTS

Cumulative impacts arise from the combined presence of several similar developments within an area which affect ecological processes operating at broader scales or which each have a small impact which becomes significant when combined. At this point, there are no known other solar developments in the vicinity of the Drennan site. The other major agent of transformation in the area is intensive agriculture which is particularly prevalent along the Great Fish River. The areas away from the floodplain and immediate environment of the river are however little impacted by transformation and are largely intact. The development of the site would contribute to the transformation of the Eastern Upper Karoo vegetation type which has not been heavily impacted by other types of transformation. Therefore the development would contribute to cumulative impact in the local area, but the broader contribution would be very low when the extent of the development is considered in relation to the extent of the receiving vegetation type.

6 CONCLUSION & RECOMMENDATIONS

Although there are no highly sensitive features or habitats within the site, the abundance of listed and protected species is quite high and many individuals of some species such as *Euphorbia globosa* would be impacted. Although this impact is potentially highly significant, the abundance of this species in the area is high and the development would not impact a large proportion of the local population of this species and the local population would not be compromised. Nevertheless, given the conservation status of this species and the abundance of protected species at the site, a preconstruction search and rescue operation should be conducted to translocate all suitable species outside the development footprint. Possibly, if the development is going to be fenced-off, a larger area than required could be fenced-off and used as a conservation area to receive the translocated individuals from the development area. As the area is currently grazed by livestock and game an area (5-10ha) that is not grazed could contribute to local biodiversity and provide a refuge area for species which are negatively affected by such grazing, as well as partly offset the negative impact of the development.

The site is also within an extensive CBA designed to function as a corridor to allow for the movement of fauna and flora in response to climate change. Although the development of the site would have a local impact, the extent of the site is low compared to the extent of the CBA corridor and it is highly unlikely that the development would compromise the overall functioning of the CBA.

Provided that the mitigation measures as suggested can be implemented, then the overall impact of the development would be of low significance and it is not likely that the development would result in an overall net loss of biodiversity or long-term degradation of the receiving environment.

7 ACTIVITIES FOR INCLUSION IN THE DRAFT EMP

Below are the measures that should be implemented as part of the EMP for the development. The measures below do not exactly match with the impacts that have been identified above, as certain mitigation measures, such as limiting the loss of vegetation may be effective at combating several different impacts, such as erosion, faunal impact etc.

Objective: Limit disturbance of the site during construction			
Project component/s	PV arrays and their support structures; access and maintenance roads; buildings.		
Potential Impact	Loss of plant cover leading to erosion as well as loss of faunal habitat		
Activity/risk source	Construction & site clearing activities		
Mitigation: Target/Objective	Maintain a ground layer to protect the site from erosion and reduce faunal impacts.		
Mitigation: Action/control		Responsibility	Timeframe
(1) Demarcate areas to be cleared (2) Clear larger woody vegetation with least possible impact to ground layer. (3) Erosion control structures should be constructed in areas of water movement (4) Revegetation of cleared areas or monitoring to ensure that recovery is taking place		Management/ECO	Construction
Performance Indicator	Ground layer cover after construction has been completed		
Monitoring	• Document pre- and post- construction cover of the ground layer. • Document revegetation actions taken and their success • Document erosion problems and the control measures implemented		

Objective: Limit impact on listed and protected species		
Project component/s	All components which create disturbance during construction	
Potential Impact	Construction and clearing will impact listed and protected plant species at the site	
Activity/risk source	Construction related disturbance	
Mitigation: Target/Objective	Successful translocation of listed plant species.	
Mitigation: Action/control	Responsibility	Timeframe
(1) Preconstruction walk-down of the access road as well as the facility itself before and clearing takes place, to locate and identify all species suitable for search and rescue	Management/ECO	Preconstruction
Performance Indicator	Successful search and rescue operation	
Monitoring	• Preconstruction survey for species suitable for search and rescue • Follow-up monitoring every 6 months for a year to assess survival rates of translocated plants.	

Objective: Limit alien plant invasion	
Project component/s	All components which create disturbance during construction
Potential Impact	Alien plant invasion leading to habitat degradation, loss of ecosystem services and loss of biodiversity
Activity/risk source	Construction related disturbance
Mitigation: Target/Objective	Low abundance of alien plant species at the site

Mitigation: Action/control	Responsibility	Timeframe
(2) Clear alien plants on a bi-annual basis.	Management/ECO	Operation
Performance Indicator	Low abundance of alien plant species at the site.	
Monitoring	• Bi-annual monitoring for the presence of alien species at the site • Records of clearing activities and the species involved	

Objective: Limit faunal impacts		
Project component/s	All components which create disturbance during construction, as well as security fencing and transmission lines	
Potential Impact	Loss of habitat and landscape connectivity for terrestrial fauna.	
Activity/risk source	Habitat transformation during construction; site fencing, presence of construction and operation personnel.	
Mitigation: Target/Objective	Low faunal impact, during construction and operation.	
Mitigation: Action/control	Responsibility	Timeframe
(1) Environmental induction for all staff (2) Use low UV lighting at night to avoid attracting insects. (3) ECO on duty during the site clearing (4) Permeable fencing at strategic places (5) No electric fencing within 30cm of the ground	Management/ECO	Construction & Operation
Performance Indicator	No mortality of fauna during construction	
Monitoring	• Monitoring for compliance during the construction phase	

8 REFERENCES

Alexander, G. & Marais, J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Nature, Cape Town.

Berliner D. & Desmet P. (2007) *Eastern Cape Biodiversity Conservation Plan: Technical Report*. Department of Water Affairs and Forestry Project No 2005-012, Pretoria. 1 August 2007

Branch W.R. 1998. *Field guide to snakes and other reptiles of southern Africa*. Struik, Cape Town.

Brownlie, S. 2005. Guideline for Involving Biodiversity Specialists in EIA Processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town. 63 pp.

Department of Environmental Affairs and Tourism, 2007. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Gazette, Republic of South Africa.

De Villiers CC, Driver A, Clark B, Euston-Brown DIW, Day EG, Job N, Helme NA, Holmes PM, Brownlie S and Rebelo AB (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape.* Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

IUCN 2012. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>. Downloaded on 19 January 2012.

Lehman, R.N., Kennedy, P.L. & Savidge, J.A. 2007. The state of the art in raptor electrocution research: a global review. *Biological Conservation* 136: 159-174.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Mucina L. & Rutherford M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge.

Smit, H.A. 2012. *Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa.* Birdlife South Africa. Available at http://www.birdlife.org.za/conservation/birds-and-wind-energy

9 ANNEX 1. LIST OF PLANTS

Listed plant species which are known to occur in the vicinity of the proposed Drennan Solar Park site. Derived from the SANBI SIBIS database (Accessed & records downloaded 10 February 2012).

Family Name	Species Name	IUCN
AMARYLLIDACEAE	*Boophone disticha*	Declining
ASPARAGACEAE	*Asparagus stipulaceus*	NT
ASPHODELACEAE	*Aloe longistyla*	DDD
ASPHODELACEAE	*Kniphofia ensifolia subsp. autumnalis*	EN
ASPHODELACEAE	*Aloe broomii var. tarkaensis*	Rare
ASTERACEAE	*Cineraria lobata subsp. lobata*	Declining
ASTERACEAE	*Gnaphalium declinatum*	NT
FABACEAE	*Umtiza listeriana*	VU
GERANIACEAE	*Pelargonium sidoides*	Declining
HYACINTHACEAE	*Drimia altissima*	Declining
HYACINTHACEAE	*Drimia uranthera*	VU
LAMIACEAE	*Salvia repens var. keiensis*	DDD
MESEMBRYANTHEMACEAE	*Nananthus vittatus*	DDT
MESEMBRYANTHEMACEAE	*Rabiea jamesii*	DDT
MYRSINACEAE	*Rapanea melanophloeos*	Declining
RUTACEAE	*Agathosma hirsuta*	Rare

10 ANNEX 2. LIST OF MAMMALS

List of mammals which are likely to occur at the proposed Drennan Solar Park. Habitat notes and distribution records are based on Skinner & Chimimba (2005), while conservation status is from the IUCN Red Lists 2012.

Scientific Name	Common Name	Status	Habitat	Probability
Macroscledidea (Elephant Shrews):				
Macroscelides proboscideus	Round-eared Elephant Shrew	LC	Species of open country, with preference for shrub bush and sparse grass cover, also occur on hard gravel plains with sparse boulders for shelter, and on loose sandy soil provided there is some bush cover	High
Elephantulus rupestris	Western Rock Elephant Shrew	LC	Rocky koppies, rocky outcrops or piles of boulders where these offer sufficient holes and crannies for refuge.	Moderate
Tubulentata:				
Orycteropus afer	Aardvark	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil	Definite
Hyracoidea (Hyraxes)				
Procavia capensis	Rock Hyrax	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies	Low
Lagomorpha (Hares and Rabbits):				
Pronolagus rupestris	Smith's Red Rock Rabbit	LC	Confined to areas of krantzes, rocky hillsides, boulder-strewn koppies and rocky ravines	Low
Lepus capensis	Cape Hare	LC	Dry, open regions, with palatable bush and grass	Low
Lepus saxatilis	Scrub Hare	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	Definite
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	High
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	Definite
Pedetes capensis	Springhare	LC	Occur widely on open sandy ground or sandy scrub, on overgrazed grassland, on the fringes of vleis and dry river beds.	High
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	Definite
Graphiurus platyops	Rock Dormouse	LC	Rocky terrain, under the exfoliation on granite bosses, and in piles of boulders	Low
Graphiurus murinus	Woodland Dormouse	LC	Woodland, rocky areas and srubland within grassland areas	High
Rhabdomys pumilio	Four-striped Grass Mouse	LC	Essentially a grassland species, occurs in wide variety of habitats where there is good grass cover.	High
Mus minutoides	Pygmy Mouse	LC	Wide habitat tolerance	High
Mastomys coucha	Southern Multimammate Mouse	LC	Wide habitat tolerance.	High
Aethomys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these preferentially	High

Aethomys granti	Grant's Rock Mouse	LC	Restricted to the karoo where they are associated with rocky terrain.	Low
Parotomys brantsii	Brants' Whistling Rat	LC	Associated with a dry sandy substrate in more arid parts of the Nama-karoo and Succulent Karoo. Species selects areas of low percentage of plant cover and areas with deep sands.	Low
Otomys unisulcatus	Bush Vlei Rat	LC	Shrub and fynbos associations in areas with rocky outcrops Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	Definite
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Gerbils associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover	High
Mystromys albicaudatus	White-tailed Mouse	EN	Variable vegetation, but live in cracks or burrows in the soil	Low
Saccostomus campestris	Pouched Mouse	LC	Catholic habitat requirements, commoner in areas where there is a sandy substrate.	High
Malacothrix typica	Gerbil Mouse	LC	Found predominantly in Nama and Succulent Karoo biomes, in areas with a mean annual rainfall of 150-500 mm.	High
Dendromus melanotis	Grey Climbing Mouse	LC	Often associated with stands of tall grass especially if thickened with bushes and other vegetation	Low
Primates:				
Papio ursinus	Chacma Baboon	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	High
Cercopithecus mitis	Vervet Monkey	LC	Most abundant in and near riparian vegetation of savannahs	Definite
Eulipotyphla (Shrews):				
Myosorex varius	Forest Shrew	LC	Prefers moist, densely vegetated habitat	High
Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Erinaceomorpha (Hedgehog)				
Atelerix frontalis	South African Hedgehog	LC	Generally found in semi-arid and subtemperate environments with ample ground cover	High
Carnivora:				
Proteles cristata	Aardwolf	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Hyaena brunnea	Brown Hyaena	NT	Nama and Succulent Karoo and the drier parts of the Grassland and Savanna Biomes	Low
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	High
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	High
Panthera pardus	Leopard	NT	Wide habitat tolerance, associated with areas of rocky koppies and hills, mountain ranges and forest	Low

Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
Genetta genetta	Small-spotted genet	LC	Occur in open arid associations	High
Suricata suricatta	Meerkat	LC	Open arid country where substrate is hard and stony. Occur in Nama and Succulent Karoo but also fynbos	Definite
Cynictis penicillata	Yellow Mongoose	LC	Semi-arid country on a sandy substrate	Definite
Herpestes pulverulentus	Cape Grey Mongoose	LC	Wide habitat tolerance	Definite
Ichneumia albicauda	White-tailed Mongoose	LC	Associated with savanna woodland in well watered areas	High
Vulpes chama	Cape Fox	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub	High
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	High
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	Definite
Aonyx capensis	Cape Clawless Otter	LC	Predominantly aquatic and do not occur far from permanent water	Low
Lutra maculicollis	Spotted-necked Otter	LC	Confined to larger rivers, lakes ans swamps	Low
Poecilogale albinucha	African Striped Weasel	LC	Primarily a savanna species that have an annual rainfall of more than 600 mm, although they have been recorded from drier areas.	High
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	High
Mellivora capensis	Ratel/Honey Badger	IUCN LC/SA RDB EN	Catholic habitat requirements	High
Rumanantia (Antelope):				
Tragelaphus strepsiceros	Greater Kudu	LC	Broken, rocky terrain with a cover of woodland and a nearby water supply.	Low
Tragelaphus oryx	Eland	LC	Wide habitat tolerance, absent from a large proportion of former range	Low
Connochaetes gnou	Black Wildebeest	LC	Central plains of the central plateau	Low
Damaliscus pygargus phillipsi	Blesbok		Plateau grasslands near water	Definite
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	High
Redunca fulvorufula	Mountain Reedbuck	LC	Dry grass-covered stony slopes hills and mountains.	High
Pelea capreolus	Grey Rhebok	LC	Associated with rocky hills, rocky mountainsides, mountain plateaux with good grass cover.	Moderate
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	Definite
Raphicerus campestris	Steenbok	LC	Inhabits open country,	Definite
Chiroptera (Bats)				
Epomophorus wahlbergi	Wahlberg's Epauletted Fruit Bat	LC	Savanna, woodland and forest margins	Low
Pipistrellus capensis	Cape Serotine Bat	LC	Wide habitat tolerances, but often found near open water	High
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	In arid areas. often associated with water sources	High
Tadarida pumila	Little free-tailed bat	LC	Wide habitat tolerance	High
Miniopterus schreibersii	Schreibers' long-fingered bat	NT	Cave dwelling and suitable caves are an essential habitat requirement	Low

Rhinolophus darlingi	Darling's Horsehoe Bat	LC	Savanna woodland species but requires caves	Low
Eidolon helvum	Straw-coloured fruit bat	LC	Occasional migratory visitors within southern Africa	Low

11 ANNEX 3. LIST OF REPTILES

List of reptiles which are likely to occur at the proposed Drennan Solar Park site. Habitat notes and distribution records are based on Branch (1988) and Alexander and Marais (2007), while conservation status is from the IUCN Red Lists 2012.

Scientific Name	Common Name	Distribution	Status	Habitat	Probability
Tortoises and Terrapins:					
Homopus femoralis	Greater Padloper	Endemic	Data Deficient	Grasslands of mountain plateaux, especially old escarpment	High
Pelomedusa subrufa	Marsh Terrapin	Widespread	Data Deficient	Slow-moving & still water, incl temporary pans	High
Snakes:					
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	Endemic	Data Deficient	Varied: semi-desert, coastal bush, fynbos & savannah	High
Leptotyphlops conjunctus conjunctus	Cape Thread Snake	Endemic		Grassland, coastal bush, savannah	High
Lamprophis capensis	Brown House Snake	Widespread	Data Deficient	Common in highveld grassland & arid karroid regions, but found everywhere & tolerant of urban sprawl	High
Lamprophis guttatus	Spotted Rock Snake	Endemic	Data Deficient	Inland mnts of Cape & Cape fold mnts, extending into S.Namibia	High
Lycophidion capense	Common Wolf Snake	Widespread	Data Deficient	Lowland forest and fynbos to moist savanna, grassland and karoo scrub	High
Pseudaspis cana	Mole Snake	Widespread	Data Deficient	Sandy scrubland in SW Cape, highveld grassland & mountainous & desert regions	High
Duberria lutrix	Common Slug Eater	Widespread	LC	Largely grassland but also moist savanna, lowland forest and fynbos	Low
Prosymna sundevalli	Sundevall's Shovel-Snout	Endemic	Data Deficient	Dry areas, incl savannah woodlands, highveld & karroid areas, entering valley bushved & fynbos in the Cape	High
Psammophylax rhombeatus	Spotted Or Rhombic Skaapsteker	Widespread	Data Deficient	Highland grassveld & fynbos, entering karroid areas	High
Psammophis notostictus	Karoo Sand or Whip Snake	Widespread	Data Deficient	Arid scrubland & karroid regions	High
Psammophis crucifer	Montane Grass Snake	Endemic	Data Deficient	Highveld and montane grassland entering fynbos	High
Dasypeltis scabra	Common/Rhombic Egg Eater	Widespread	LC	Absent only from true desert & closed-canopy forest	High
Crotaphopeltis hotamboeia	Herald Snake	Widespread	Data Deficient	Terrestrial but more common in wetlands	High
Aspidelaps lubricus	Coral Shield Cobra	Widespread	Data Deficient	Karroid & sandveld regions, entering dry valley plains in S and E Cape	High
Naja nivea	Cape Cobra	Endemic	Data Deficient	Arid karroid regions, particularly along river courses, entering well drained open areas along the southern coast	High
Causus rhombeatus	Common Night Adder	Widespread	Data Deficient	Mesic savannah	Low

Bitis arietans	Puff Adder	Widespread	Data Deficient	Absent only from desert & mntn tops	High
Lizard and Skinks:					
Acontias gracilicauda namaquensis	Thin-tailed Legless Skink	Endemic	Data Deficient	Valley bushveld, grassland entering sandy regions	High
Mabuya capensis	Cape Skink	Widespread	Data Deficient	Very varied: arid karroid veld, moist coastal bush, montane grassland, etc	High
Pedioplanis burchelli	Burchells' Sand Lizard	Endemic	Data Deficient	Rocky montane grassland	High
Pedioplanis lineoocellata	Spotted Sand Lizard	Endemic	Data Deficient	Very varied: karroid veld, valley bushveld & arid & mesic savannah	High
Cordylus polyzonus	Karoo Girdled Lizard	Endemic	Data Deficient	Karroid regions	High
Pseudocordylus microlepidotus	Cape Crag Lizard	Endemic	Data Deficient	Mountain plateaus & upper slopes in fynbos or montane grassland	High
Varanus albigularis	Rock Monitor	Widespread	Data Deficient	Savanna and arid karroid areas	High
Agama atra	Southern Rock Agama	Endemic	Data Deficient	Semi-desert to fynbos, from sea level to mountain tops	High
Chameleons:				Data Deficient	
Bradypodion karroicum	Karoo Dwarf Chameleon	Endemic	Data Deficient	Sparse thorn bushes along river courses; adapting to urban gardens	High
Geckos:				Data Deficient	
Afroedura karroica	Karoo Flat Gecko	Narrow Endemic	Data Deficient	Sandstone outcrops in montane grassland	Low
Chondrodactylus bibronii	Bibron's Tubercled Gecko	Endemic	Data Deficient	Rocky outcrops, cliffs and large trees	High
Pachydactylus capensis	Cape Thick-toed Gecko	Widespread	Data Deficient	Karroid veld, grassland and mesic savannah	High
Pachydactylus geitje	Ocellated Gecko	Endemic	Data Deficient	Debris, rotting logs, loose lark, moribund termitaria	Low
Pachydactylus maculatus	Spotted Thick-toed Gecko	Endemic	LC	Varied: fynbos & coastal bush to arid karroid veld	High
Pachydactylus oculatus	Golden Spotted Thick-toed Gecko	Endemic	LC	Karroid veld	High
Pachydactylus mariquensis	Marico Thick-toed Gecko	Endemic	Data Deficient	Flat sandy plains with sparse vegetation	High

12 ANNEX 4. LIST OF AMPHIBIANS

List of amphibians which are likely to occur at the Drennan Solar Park site. Habitat notes and distribution records are based on Du Preez and Carruthers (2009), while conservation status is from the IUCN Red Lists 2012.

Scientific Name	Common Name	Status	Habitat	Distribution	Probability
Amietophrynus rangeri	Raucous Toad	Not Threatened	Rivers and stream in grassland and fynbos	Endemic	High
Poyntonophrynus vertebralis	Southern Pygmy Toad	Not Threatened	Nama karroo shrubland, grassland, dry savannah and pastureland. Breeds in temporary shallow pans, pools or depressions containing rainwater	Endemic	High
Vandijkophrynus gariepensis	Karoo Toad	Not Threatened	Karoo Scrub	Widespread	High
Kassinia senegalensis	Bubbling Kassinia	Not Threatened	Grassland around vleis and pands	Widespread	High
Phrynobatrachus natalensis	Snoring Puddle Frog	Not Threatened	Along margins of permanent and temporary water bodies	Widespread	Low
Pyxicephalus adspersus	Giant Bullfrog	Near Threatened	Breed in shallow margins of rain-filled depressions.	Widespread	Low
Xenopus laevis	Common Platanna	Not Threatened	Any more or less permanent water	Widespread	High
Cacosternum boettgeri	Common Caco	Not Threatened	Marshy areas, vleis and shallow pans	Widespread	High
Amietia angolensis	Common River Frog	Not Threatened	Banks of slow-flowing streams or permanent bodies of water	Widespread	Low
Amietia fuscigula	Cape River Frog	Not Threatened	Large still bodies of water or permanent streams and rivers.	Widespread	Low
Tomopterna tandyi	Tandy's Sand Frog	Not Threatened	Nama karoo grassland and savanna	Widespread	High

SHORT CV OF CONSULTANT:

SUMMARY OF EXPERTISE

Simon.Todd@3foxes.co.za

P.O.Box 71
Nieuwoudtville
8180
H: 027 218 1276
C: 082 3326 502

- Profession: Ecological Consultant
- Specialisation: Plant & Animal Ecology
- Years of Experience: 15 Years

Skills & Primary Competencies

- Research & description of ecological patterns & processes in Nama Karoo, Succulent Karoo, Thicket, Arid Grassland, Fynbos and Savannah Ecosystems.
- Ecological Impacts of land use on biodiversity
- Vegetation surveys & degradation assessment & mapping
- Long-term vegetation monitoring
- Faunal surveys & assessment.
- GIS & remote sensing

Tertiary Education:

- 1992-1994 – BSc (Botany & Zoology), University of Cape Town
- 1995 – BSc Hons, Cum Laude (Zoology) University of Natal
- 1996-1997- MSc, Cum Laude (Conservation Biology) University of Cape Town

Employment History

- 1997 – 1999 – Research Scientist (Contract) – South African National Biodiversity Institute
- 2000-2004 – Specialist Scientist (Contract) - South African National Biodiversity Institute
- 2004-2007 – Senior Scientist (Contract) – Plant Conservation Unit, Department of Botany, University of Cape Town
- 2007 Present – Senior Scientist (Associate) – Plant Conservation Unit, Department of Botany, University of Cape Town.

General Experience & Expertise

- Conducted a large number of fauna and flora specialist assessments distributed widely across South Africa, including a large number of renewable energy facilities. Projects have ranged in extent from <50 ha to more then 50 000 ha.
- Involved in all phases of renewable energy development, from ecological prefeasibility studies to pre-construction walk-through.
- Widely-recognized ecology specialist. Published numerous peer-reviewed scientific publications based on various ecological studies across the country. Past chairman of the Arid Zone Ecology Forum and current executive committee member.
- Extensive experience in the field and exceptional level of technical expertise, particularly with regards to GIS capabilities which is essential with regards to producing high-quality sensitivity maps for use in the design of final project layouts.
- Strong research background which has proved invaluable when working on several ecologically sensitive and potentially controversial sites containing some of the most threatened fauna in South Africa.
- Published numerous research reports as well as two book chapters and a large number of papers in leading scientific journals dealing primarily with human impacts on the vegetation and ecology of the arid and semi-arid parts of South Africa.
- Maintain several long-term vegetation monitoring projects distributed across Namaqualand and the karoo.
- Guest lecturer at two universities and have also served as an external examiner.
- Reviewed papers for more than 10 international ecological journals.
- Past chairman and current committee member of the Arid Zone Ecological Forum.
- SACNASP registered as a Professional Natural Scientist, (Ecology) No. 400425/11.

A selection of recent work is as follows:

Specialist Assessments:

Wind Farm Developments:

Proposed Spitskop Wind Energy Facility: Fauna & Flora Specialist Study For Impact Assessment. Savannah Environmental 2013.

Proposed Mainstream South Africa Springfontein Wind Energy Facility: Terrestrial Fauna & Flora Specialist Study for EIA. Savannah Environmental 2012.

Environmental Impact Assessment for the Establishment of the Wolseley Wind Farm, Western Cape Province. Fauna & Flora Specialist Report. Arcus Gibb 2012.

Proposed Eskom 300MW Kleinsee Wind Energy Facility. Fauna Specialist Report For Impact Assessment. Savannah Environmental 2012.

Proposed Inca Energy Swellendam Wind Energy Facility: Fauna Specialist Report For Impact Assessment. Savannah Environmental 2012.

Proposed Moorreesburg Wind Energy Facility: Fauna & Flora Specialist Scoping Report For Impact Assessment. Savannah Environmental 2012.

Terrestrial Ecology Specialist Study for the Proposed Establishment of a Renewable Energy Facility near Sutherland, Western and Northern Cape Provinces. Environmental Resources Management (ERM) 2011.

Roggeveld Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management (ERM). 2011.

Zen Wind Energy Facility. Fauna & Flora Specialist Impact Assessment Report. Savannah Environmental. 2012.

Proposed Project Blue Wind and Solar Energy Facility, Near Kliensee. Fauna Specialist Report For Impact Assessment. Savannah Environmental 2012.

Garob Wind Farm: Fauna & Flora Specialist Report for Impact Assesment. Savannah Environmental 2012.

Loeriesfontein Wind Energy Facility – Substation & Grid Connection. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Noblesfontein Wind Energy Facility, Victoria West. Ecological Walk-Through Report. Savannah Environmental 2012.

Gouda Wind Energy Facility. Fauna And Flora Walk Through Report. Savannah Environmental 2012.

Noblesfontein Wind Energy Facility, Victoria West. Ecological Walk-Through Report. Savannah Environmental 2012.

Klawer Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Lambert's Bay Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Richtersveld Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management (ERM). 2011.

Witberg Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management (ERM). 2011.

Solar Energy Developments:

Specialist Vegetation Assessment for EIA. The Proposed Commercial Concentrated Solar Power Tower Facility and Concentrated Photovoltaic Facility at Van Roois Vley Near Upington. WSP 2012.

Proposed Photovoltaic Solar Energy Facility on Konkoonsies, Northern Cape: Fauna & Flora Specialist Report for Impact Assessment. EScience Associates 2012.

Proposed Padrooi 13 Photovoltaic Solar Energy Facility, Northern Cape: Fauna & Flora Specialist Report for Impact Assessment. EScience Associates 2012.

Adams Photovoltaic Solar Energy Facility, Northern Cape: Fauna & Flora Specialist Report for Impact Assessment. EScience Associates 2012.

Proposed Photovoltaic Solar Energy Facility on Klein Swart Bast, Northern Cape: Fauna & Flora Specialist Report for Impact Assessment. EScience Associates 2012.

Proposed Khoi-Sun Solar Facility. Fauna & Flora Specialist Report for Impact Assessment. Cape EAPrac 2012.

Suurwater 62, Boesmanland 75mw Solar Farm, Aggeneys. Fauna & Flora Specialist Report for Impact Assessment. Cape EAPrac 2012.

Karoshoek Solar Valley Development, Upington: Fauna & Flora Specialist Impact Assessment Report. Savannah Environmental. 2012.

O'Kiep 3 PV Solar Energy Facility on a Site In O'kiep Near Springbok, Northern Cape Province. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Photovoltaic Solar Energy Facility on Voëlklip, South of Springbok. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Namaqua Photovoltaic Solar Energy Facility on a Site North of Kamieskroon. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Inca Graafwater Photovoltaic Solar Energy Facility, Graafwater, Western Cape Province. Faunal Ecology Specialist Report for Impact Assessment. Savannah Environmental 2012.

Aberdeen Solar Facility. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Venetia Solar Facility. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Southern Cross Solar Energy Facility: Southern Farm 425. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Tutwa Solar Energy Facility: Portion 4 of Narries 7. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Valleydora Photovolataic Solar Power Plant, Free State. Fauna & Flora Specialist Report. CSIR, 2012.

Reddersburg Solar Facility - Fauna & Flora Specialist Assessment. CSIR, 2012.

Melkvlei Photovolataic Solar Power Plant. Fauna & Flora Specialist Report for Basic Assessment. Specialist report for ERM. 2012.

Ruinte Photovolataic Solar Power Plant. Fauna & Flora Specialist Report for Basic Assessment. Specialist report for ERM. 2012.

Genoegsaam Solar Park. Fauna & Flora Specialist Report for Basic Assessment. Specialist report for ERM. 2012.

Genoegsaam Solar Park. Fauna & Flora Specialist EIA Report. Specialist report for ERM. 2012.

Graspan Solar Facility. Fauna & Flora Specialist Report for Impact Assessment. Specialist report for ERM. 2012.

Olyven Kolk Solar Power Plant, Northern Cape: Botanical and Faunal Specialist Assessment. Specialist Report for Environmental Resources Management (ERM). 2011.

Skuitdrift Solar Facility. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Cape EAPrac. 2012.

Beaufort West Solar Facility, Erf 7388 - Fauna & Flora Specialist Assessment. Specialist Report for Cape EAPrac. 2012.

Khoi-Sun Solar Facility. Fauna & Flora Specialist Scoping Report. Specialist Report for Cape EAPrac. 2012.

Boesmanland Solar Farm. Fauna & Flora Specialist Scoping Study. Specialist Report for Cape EAPrac. 2012.

Bitterfontein Solar Plant - Fauna & Flora Specialist Assessment. Specialist Report for Cape EAPrac. 2012.

Power Lines/Grid Connections:

Karoshoek Grid Integration Infrastructure. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Garob to Kronos Power Line - Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Loeriesfontein Wind Energy Facility – Substation & Grid Connection. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.

Gouda Wind Energy Facility – Grid Connection. Walk-Through of Overhead Power Line - Gouda WEF to Eskom Windmill Substation. Specialist Report for Savannah Environmental. 2012.

Proposed Kappa-Omega 765 KV Transmission Line. Fauna, Flora & Ecology Walk-Through Report. Specialist Report for ACER Africa. 2013.

Infrastructure/Mining Developments:

Proposed Establishment of the Gamsberg Zinc Mine, Concentrator Plant and Associated Infrastructure near the Town of Aggeneys, Northern Cape. Fauna & Flora Specialist Report For ESIA. ERM 2013.

Pella Water Board – Infrastructure Upgrade. Fauna & Flora Specialist Report for Basic Assessment. Environmental Resources Management 2012.

Transnet Manganese Ore Line Upgrade. Fauna & Flora Specialist Report for Basic Assessment. Environmental Resources Management 2012.

Proposed Mamatwane Compilation Yard, Northern Cape: Fauna & Flora Specialist Report for Impact Assessment. Environmental Resources Management 2013.

Rare Earth Separation Plant Near Vredendal, Western Cape Province. Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2012.

Improvements to the Ou Kaapse Weg / Silvermine Road Intersection. Specialist Faunal Study For Basic Assessment. Khula Environmental Consultants, 2012.

Upgrading of Tourism Facilities at Goegap Nature Reserve. Specialist Ecological Assesment. Van Zyl Environmental Consultants. 2012.

Plant Sweeps on Portion 2 of the Farm Demaneng 546, Kuruman District, Northern Cape Province for SA Manganese. 2011.

Strategy/Conceptual Documents:

Renewable Energy Sector Spatial Planning Tool: To Form Part of the NDM Green Economy Strategy. Conservation South Africa, 2013.

Terrestrial Environment: Characteristics and Categorization. Contribution to the development of standards for EIA processes on behalf of the DEA. Anchor Environmental 2012.

Annex G

Paleontological, Archaeological and Cultural Heritage Specialist Report

ENVIRONMENTAL IMPACT ASSESSMENT HERITAGE REPORT: PROPOSED CONSTRUCTION OF A 90 MW PHOTOVOLTAIC POWER FACILITY ON THE FARM WAAI PLAATS AT DRENNAN, GREAT FISH RIVER VALLEY EASTERN CAPE PROVINCE

(Assessment conducted under Section 38(8) of the
National Heritage Resources Act 25 of 1999)

Prepared for:
ERM Southern Africa (Pty) Ltd
Lindsey Bungartz
Silverwood House Block A
Silverwood Close
Steenberg Office Park, 7945
Tel: 021 702 9100
Dean.Alborough@erm.com

May 2013

Prepared by:
Tim Hart & Liesbet Schietecatte
ACO Associates
8 Jacobs Ladder
St James
7945
Tim.Hart@aco-associates.com

GLOSSARY

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

Early Stone Age: The archaeology of the Stone Age between 700 000 and 2500 000 years ago.

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

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.

Holocene: The most recent geological time period which commenced 10 000 years ago.

Late Stone Age: The archaeology of the last 20 000 years associated with fully modern people.

Middle Stone Age: The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.

National Estate: The collective heritage assets of the Nation

Palaeontology: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Pleistocene: A geological time period (of 3 million – 20 000 years ago).

SAHRA: South African Heritage Resources Agency – the compliance authority which protects national heritage.

Structure (historic:) Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.

Trekboer. A farmer who moves stock from locality to locality on a seasonal cycle.

Wreck (protected): A ship or an aeroplane or any part thereof that lies on land or in the sea within South Africa is protected if it is more than 60 years old.

Acronyms

DEA	Department of Environmental Affairs
ESA	Early Stone Age
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency
PHS	Provincial Heritage site

EXECUTIVE SUMMARY

ACO Associates cc were appointed by ERM Southern Africa (Pty) Ltd, on behalf of the proponent, Solaire Direct, for the construction of a proposed 90 MW photovoltaic power facility on a portion of the farm Waai Plaats at Drennan between Cradock and Cookhouse in the Great Fish River Valley

A survey of the land was conducted by Liesbet Schietecatte and Tim Hart in July 2012. The desktop Palaeontological Impact Assessment (PIA) was conducted by Dr Graham Avery of Iziko Museums of Cape Town….

The following heritage indicators were identified:

- According to the desktop PIA report, the proposed site is located in a palaeontologically-sensitive region with a hard rock base of the potentially fossiliferous Permian (circa 250 Ma (million years old) Balfour Formation and more recent (circa 20 Ma to the present) alluvial sediments, which may also contain fossil and sub-fossil remains.
  A stone alignment or kraal thought to be of pre-colonial age lies in the development area.
- Two stone cairns, possibly pre-colonial burial cairns lie in the development area.
- There is an abandoned historical square stone kraal in the development area.
- No buildings were recorded or near the proposed site.
- The Cultural Landscape is grasslands used as pastures for livestock and game. It is considered of low significance but lies within the scenic context of the Fish River Valley

The following mitigation measures are recommended:

- Palaeontological mitigation is required. The study area lies on ancient bedrocks rocks of the Balfour formation which have high fossil potential. A pre-disturbance site visit is recommended followed by monitoring of the earthworks phase of the development by a professional palaeontologist. If significant material is found it will need to be excavated/sampled and housed at a regional or national museum. The Environmental Control Officer (ECO) responsible for the development must remain aware that all sedimentary deposits have the potential to contain fossils and he/she should thus monitor all substantial excavations into sedimentary bedrock for fossil remains. If any fossils are found during construction, SAHRA should be notified immediately;
- The two possible graves (DRN 11 and DRN 14) automatically get a very high significance rating in heritage terms as they are covered by legislation at national level and the procedures for their exhumation are long and onerous. It is recommended that a 10 m buffer zone be implemented around each potential grave and they are left undisturbed or a permit for exhumation of the graves be applied for and the contents of the graves be subject to basic forensic assessment and be relocated. The process of exhumation will require consultation with interested parties which will need to include local residents and Khoisan interest groups (who have become quite well established in the Eastern Cape). The process can take in excess of 4 months to obtain a permit.
- The pre-colonial stone kraal (DRN 13) is a good example of its kind and should be considered to be worthy of a grade IIIA rating (which means of high local significance) on account of its complete and original condition. The best mitigation scenario is that it is conserved in-situ within a 10 m radius of exclusion from the perimeter of the kraal, or the kraal must be thoroughly recorded by an archaeologist

by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition.

- The historic kraal (DRN 15) is of a form which is well represented in the Karoo and not considered especially important. Under ideal circumstances it should be conserved, however should it be necessary to demolish it, this can be done under a demolition permit issued by the Eastern Cape Provincial Heritage Resources Authority.

The proposed area for the facility is acceptable; however the above mitigation will be necessary.

TABLE OF CONTENTS

1. INTRODUCTION

ACO Associates cc were appointed by ERM Southern Africa (Pty) Ltd on behalf of the proponent, Solaire Direct, to provide specialist heritage input into the full Environmental Impact Assessment (EIA) for the construction of the proposed Drennan photovoltaic power facility Portion 15, of Portion 1, of the Farm Waai Plaats (no. 550) at Drennan. The proposed facility will be situated on the western side of the Great Fish River Valley, about 40 km east of Cradock down the N10.

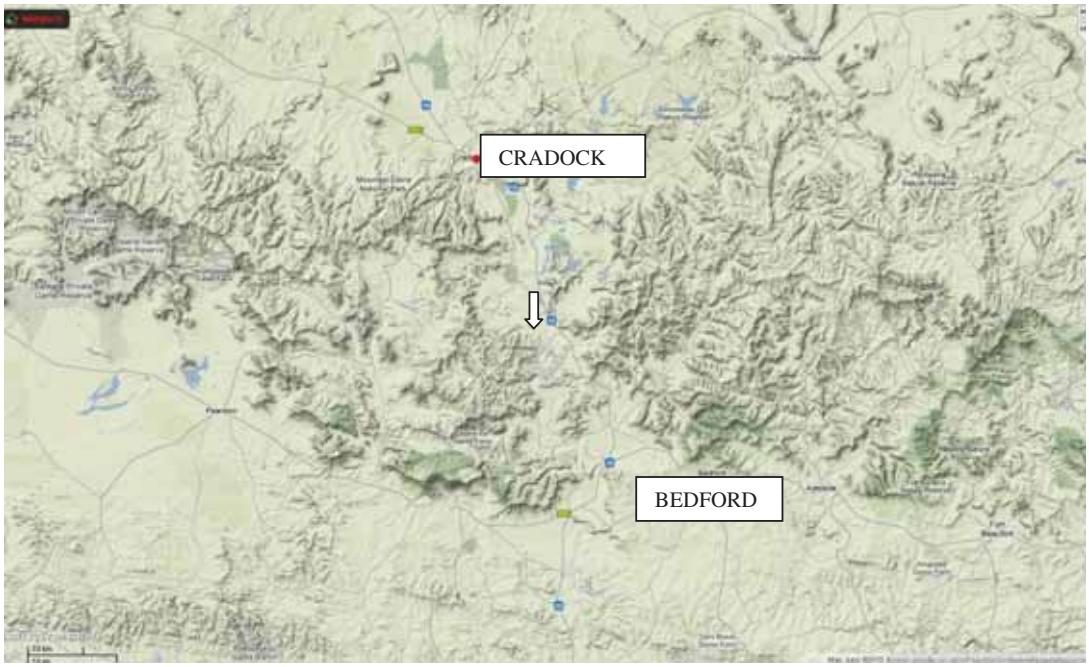


Figure 1: Location of the proposed PV power facility located between Bedford and Cradock on the N10.

2. DEVELOPMENT PROPOSALS

It is anticipated that the project will feed a total of 90 MWs into the national grid. The key components of the proposed PV power plant include the following:

- PV solar panels/modules (arranged in arrays);
- PV module mountings;
- DC-AC current inverters and transformers;
- New 2500m^2 grid connection substation;
- New 4000m^2 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.

The proposed development will include PV solar panels. The PV panels will be mounted on aluminium fixed frame structures approximately 3.33m in height from the ground. The aluminium structures will be mounted on steel screw piles or concrete foundations 1500mm deep, depending on soil conditions. The distance or spacing between rows will be approximately 6.2m. The 132kV power from the new grid connection substation will be connected to the existing Eskom grid. Existing gravel roads will be upgraded to 6m in width. It is anticipated that the proposed activity will involve ground levelling in the affected areas hence there will be significant disturbance of surface deposits. A proposed location for the PV facility has been provided, however this may undergo change during the EIA process.

3. TERMS OF REFERENCE

The assessment includes:

- A desk top study to determine the pre-history and history of the property;
- A site visit to locate and map heritage resources;
- The rating of significance of heritage resources on the property;
- An assessment of whether the construction of the solar facility will result in a loss of significant heritage resources;
- Recommendations for mitigation if necessary; and
- A proposed location for the PV facility was provided, however it was requested that the specialist teams consider this in broader context of the study area and indicate the suitability of the position of the proposed facility.

4. LEGISLATION

The National Heritage Resources Act, No 25 of 1999 (Section 38 (1)) makes provision for a compulsory notification of the intent to development when any development exceeding 5000m² in extent, or any road or linear development exceeding 300m in length is proposed.

The NHRA provides protection for the following categories of heritage resources:

- Cultural landscapes (Section 3(3))
- Buildings and structures greater than 60 years of age(Section 34)
- Archaeological sites greater than 100 years of age(Section 35)
- Palaeontological sites and specimens
- Shipwrecks and aircraft wrecks
- Graves and grave yards (Section 36).

With respect to the Cultural Landscape, the Visual Impact Assessment (VIA) is being conducted by a VIA specialist. Nevertheless, in terms of Section 3 (2)(d) of the NHRA, No 25 of 1999, the national estate may include “landscapes and natural features of cultural significance”. It is important that the VIA specialist examines the impact of the development on the cultural landscape or consults with a heritage practitioner in this regard.

The Palaeontological Impact specialist report was conducted by Dr Graham Avery of the Iziko Museums of Cape Town. The report is attached in full at the end of this HIA (Appendix 2).

5. RECEIVING ENVIRONMENT

It is proposed to construct the PV power facility on an east facing slope on the western side of the Great Fish River Valley close to Drennan Station on the Midland Railway system.

Plate 1: A panorama over the landscape looking east over the Great Fish River valley and Drennan Station. The development site lies behind the photographer**.**

The proposed development area takes the form of a flat shoulder or terrace of land on the Western Side of the Great Fish River Valley. The ground is un-undeveloped apart from a wind pump and dam, tracks and a 400 kV transmission line and service road. The land which is typically eastern Karoo is stony (shales, hornfels and dolerites) and devoid of large trees. Used for grazing only, the land also contained a herd of springbok and a number of Kudu, noted during the site visit. The N10, the main route through the area lies on the east side of the river about 5 km east of the site.

Plate 2: View to the west over the development site.

5.1 Palaeontological Background

The Great Karoo is one of the world's most important repositories of palaeontological information about the evolution on both marine and terrestrial plants and animals. In popular literature it is described thus:

*"The **Karoo Supergroup** is the largest stratigraphic unit in Southern Africa, covering almost two thirds of the present land surface, including central Cape Province, almost all of Orange Free State, western Natal, much of south-east Transvaal, Zambia, Zimbabwe and Malawi. The basins in which it was deposited formed during the formation and breakup of Pangea.*

Its strata, mostly shales and sandstones, record an almost continuous sequence of marine glacial to terrestrial deposition from the Late Carboniferous to the Early Jurassic, a period of about a hundred million years. These accumulated in a retroarc foreland basin called the "main Karoo" Basin. This basin was formed by the subduction and orogenesis along the boundary of Gondwana (the past African continent) and the Panthalassan Sea (paleo-Pacific).[3] Its sediments attain a maximum cumulative thickness of 12 km, with the overlying basaltic lavas (the Drakensberg Group) at least 1.4 km thick.[1]

Fossils include plants (both macro-fossils and pollen), rare insects and fish, common and diverse tetrapods (mostly therapsid reptiles, temnospondylamphibians, and in the upper strata dinosaurs), and ichnofossils. Their biostratigraphy has been used as the international standard for global correlation of Permian to Jurassic nonmarine strata". (2012 Wikipedia: http://en.wikipedia.org/wiki/Karoo_Supergroup)

The geology of the Drennan area 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 as well as fossil plant remains. The rocks of the Beaufort Group are sub-divided into assemblage zones according to the various vertebrate fossils found in each zone. Genoegsaam 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).

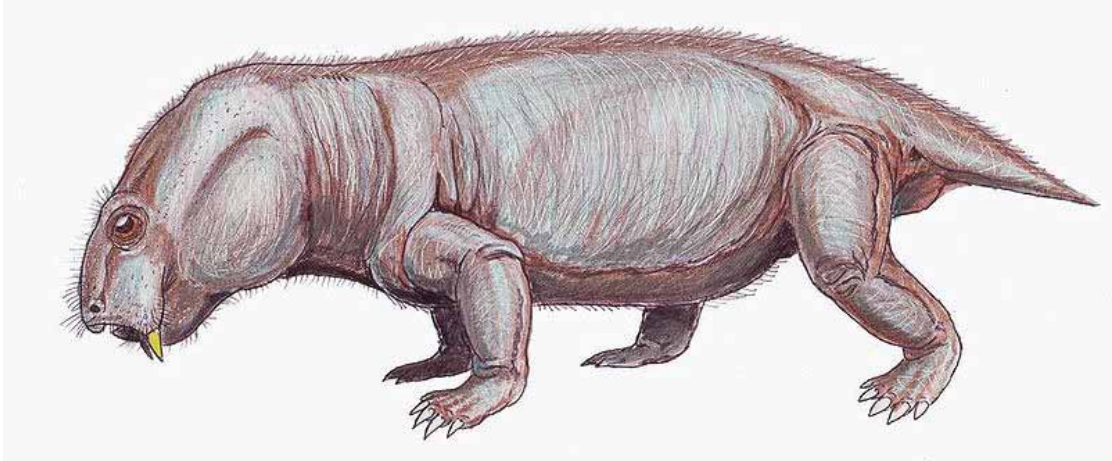


Figure 2: Artists reconstruction of a *Dicynodon* (Wikimedia commons)

5.2 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 Cradock area – where freshwater mussel middens containing stone implements and pottery were recorded from the banks of the Fish River. A certain JJ Kissack from Cradock started making donations of implements to the Museum during the 1930s. His collections included Early and Middle Stone Age material, including artefacts from the Conway station (near to the site).

We can therefore anticipate that the study area will contain artefactual material dating to the Early Stone Age and Middle Stone Age (MSA) of the Pleistocene epoch (*3 million – 20 000 years ago)*. This material is often noted in eroded areas, or on terraces in river valleys. Under very rare circumstances it is found in undisturbed contexts in association with fossil bone. Such sites enjoy high status in research terms as they have the potential to produce significant information about early human behaviour. A survey by Webley & Hart (2010) on the farms Denmark and Groene Vallei on the R61 to the west of Cradock, identified surface scatters of MSA and Late Stone Age (LSA) artefact scatters along a rocky ledge on Denmark and a “factory” or “quarry” site on Groene Vallei.

Excavations by Hewitt (1931) at Tafelberg Hall and by Deacon (1976) at Highlands Rock Shelter near Cradock have produced LSA materials from both rock shelters. Deacon (1976) has two dates of 4 500BP and 3570BP from Highlands Rock Shelter. Illustrations of stone tools in Deacon’s (1976) monograph show that both sites contained end scrapers and backed microliths on indurated shale. Deacon also refers to excavations by Pat Kramer of a freshwater shell midden on the Fish River but this unfortunately was never published.

However, the most comprehensive survey of LSA archaeology from open sites was conducted by CG Sampson over a period of 30 years. His study area comprises the Zeekoe Valley (Seacow River Valley), situated between Middelburg and Richmond (Sampson 1992), at least 50km west of the proposed facility. His detailed research has resulted in a comprehensive body of information which we may "borrow from" in terms of predicting the pre-colonial sensitivity of the area.

We may predict with some confidence that there will be LSA 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. Sampson's surveys have revealed that LSA sites are very seldom found on the flat Karoo plains but almost always are associated with natural foci – especially dolerite dikes. The introduction of pastoralism (sheep and goats, later cattle) roughly 2000 years 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 transhumant communities (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 centers such as Graaff Reinet prevailed, and the "wild bushman" of the Karoo were rendered extinct by the early 19th century.

5.3 Historical Background

Sampson has recorded the spread of European settlement into the Seacow River Valley, which is located to the west of Middelburg. According to Sampson *et al* (1994), the first Trekboers settled in the headwaters of the Seacow River valley in the 1770s but many were driven out by attacks from Bushmen. A few farms were re-occupied in the 1780s and 1790s. "Land seizures from resident Bushmen were legitimised by the granting of Loan Places, i.e. rectangular 3000 morgen tracts of Karoo veld separated by unclaimed land" (Neville et al 1994:65).

Colonial Period

European farmers (*Trekboere*) were the vanguard of formal colonisation and accelerated granting of land by the British Colonial Government. The farms in the Fish River Valley were all occupied by Dutch speaking farmers by 1825. The implication of this is that the farmers (who were probably *trekboers*) had by that time already informally occupied the land, the deeds of which were made official by the British Colonial Government.

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.

From the beginning of the British occupation of the Eastern Cape, tensions developed with farming Xhosa groups who ventured southwards out of the summer rainfall areas to seek season grazing for their herds. During much of the 18th century the frontier wars took place. The Fish River a fortified frontier zone between the colony of the Cape Province and the Xhosa nation, who for much of the 19th century did their utmost to drive out the settlers (Mostert 1992).

The historic road into the interior from Algoa Bay seems to have followed quite closely the route of the railway line or the N10 but meandered more towards Somerset East rather than Cookhouse. Skead (2007) indicates the area as having been open Karoo veld in parts, but mostly vast plains of sweet grassland. Early travelers noted the presence of large games animals on the coastal plains, as well as hippos in the Fish River.

Craddock was established as a sub-drosdy to Graaff-Reinet in the context of increasing tension with the Xhosa across the Fish River. Slow to develop as a town it increased status due to the construction of a church in 1842 made it a more desirable place to reside. With the blossoming of the wool trade Craddock became a regional center. Today it is considered one of the finest heritage towns in the country as a result of local conservation efforts.

Cookhouse however seems to have played a minor role in those early years seldom receiving mention. The area derived its name from an early British military camp kitchen, however indications are that little physical evidence exists today.

Drennan itself is not a town but a railway station on the midland railway system. This railway was one of three core routes that were constructed between the main ports of British held parts of South Africa to Aar between 1870 and 1890. Drennan is likely to have been constructed circa 1881-1882. This railway system was later heavily fortified during the second Boer War.

Plate 3: Archaeologist Tim Hart records a circular stone feature on the edge of the study area

6. METHODOLOGY

The survey was conducted by Tim Hart (MA) and Liesbet Schietecatte (MA MSC) on 36-29 July 2012. All identified heritage sites/archaeological occurrences were plotted with a Garmin GPS-map62s handheld GPS, photographed and their significance rated. No archaeological material was removed from the project area, but recorded and photographed *in situ*. The reader of this report is referred to the appendices which contain the details of the archaeological observations made in the field.

The desktop Palaeontological Impact Assessment was conducted by Dr Graham Avery of Iziko Museums of Cape Town.

6.1 Limitations

There were no restrictions to the survey. Visibility was good and the landowner enabled access to the property.

7. ASSESSMENT OF IMPACTS

Details of archaeological and palaeontological finds are indicated in Appendices 1 and 2.

7.1 Impacts to palaeontology

With regard the palaeontology of the area (see Appendix 2 at the end of the report) the Palaeontological Impact Assessment has indicated that the rocks of the area belong to the

Beaufort Group which is world-renowned for its rich fossil record. Fossils are potentially present in shales in the area, however the presence of dolerite extrusions and dykes as well as indurated rock means that well preserved fossils are an unlikely occurrence on the surface. Excavations that involve excavation into or exposure of bedrock are likely to impact fossil material.

Table 1: Impacts to Palaeontology

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent (loss of palaeontological resources is permanent)	n/a
Intensity	High	Low
Probability	Low	Low
Confidence	Medium	Medium
Significance	High	Low
Nature of cumulative impact	High	
Can impact be reversed?	No, palaeontological resources are non-renewable	
Impact may cause irreversible loss of resources	Yes, if fossils are destroyed.	
Can impact be mitigated?	The site must be subject to a pre-disturbance site inspection and a palaeontologist must conduct site inspections during bulk earthworks. Any fossil material found will need to be excavated or sampled and curated at a regional or national museum.	

7.2 Archaeology

The archaeological findings are discussed in detail in Appendix 1.

Four archaeological sites were found within the study area. There is a very well preserved Koekhoen stone kraal/alignment (circa 1000 – 1400 AD) (DRN13), an historic kraal (DRN 15) and two potential pre-colonial graves (DRN 11 and DRN 14).

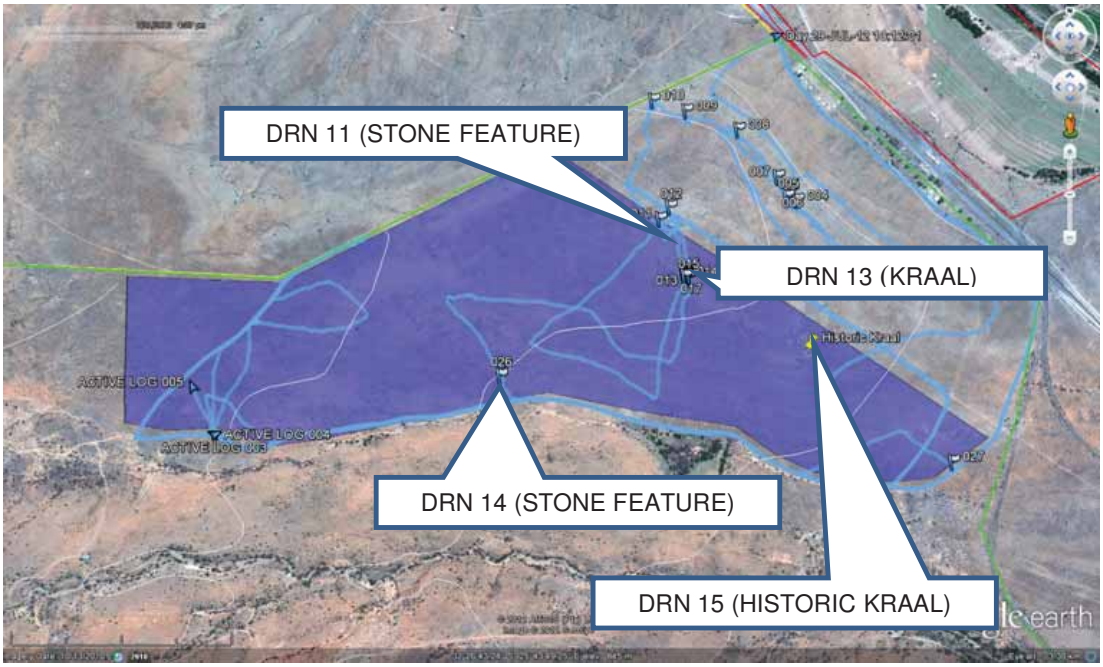


Figure 3: The study area showing archaeological sites found within its boundaries. Note that more are found between the eastern edge of the study area and Drennan Station.

The kraal (DRN 13) is best conserved in-situ due to its completeness, however if this is not possible, it will need to be destroyed under a permit issued by the Eastern Cape Provincial Heritage Resources Authority (ECPHRA). For this to happen it will need to be recorded and documented first by an archaeologist.

The two possible graves (DRN 11 and 14 both of which lie close to the edge of the proposed site) are best left in-situ in a 10 m buffer zone as the process of exhumation is time consuming, costly and requires its own public process in terms of section 36 of the National Heritage Resources Act 25 of 1999.

The historical kraal (DRN 15) is well represented in the karoo but protected under the NHRA. This may be demolished subject to a permit being issued by ECPHRA.

Table 2: Impacts to Pre-colonial Archaeology (Stone Cairns DRN 11 and DRN 14, and Kraals DRN 13 and DRN 15)

The impact of the construction of the PV power facility on the pre-colonial archaeology is potentially high and mitigation is required.

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent (loss of archaeological resources is permanent)	n/a
Intensity	High	Low
Probability	Medium	Low
Confidence	Medium	Medium
Significance	High/Critical	Medium (-ve): If permit

		obtained and graves and kraals destroyed.
		Negligible: If grave and kraal sites completely avoided and left in-situ with no preservation or documentation.
		Moderate (+ve): If grave and kraal sites are avoided, documented by an archaeologist and preservation action undertaken.
Nature of cumulative impact	Low	
Can impact be reversed?	No, archaeological resources are non-renewable	
Impact may cause irreversible loss of resources	Yes, damage to grave sites would be irreversible, and well preserved early Khoekhoen kraals are rare.	
Can impact be mitigated?	Yes, either by the correct permit and regulatory process requirements or by avoidance or by avoidance and preservation.	

7.3 Built Environment

There are no buildings apart from a disused historic kraal on or close to the study area apart from station buildings at Drennan which are typical railway buildings built after the mid-twentieth century. These are mostly in very poor condition, some occupied by farm workers, others vandalised and stripped.

Table 3: Impacts to the Built Environment

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	n/a	n/a
Intensity	Low	Low
Probability	Low	Low
Confidence	High	High
Significance	Low	Low
Nature of cumulative impact	None	
Can impact be reversed?	No	
Impact may cause irreversible loss of resources	No.	
Can impact be mitigated?	No	

7.4 Landscape and Setting.

While the Fish River Valley contains a mosaic of cultivated land in and along the river flood plain, the study area is at a higher elevation and well above the cultivated land. Although it is technically agricultural land, it is uncultivated and used for grazing. Springbok and Kudu were seen on the property. The land is best described as having wilderness qualities rather

than being part of a human made of agricultural landscape. Being far from any significant heritage places, impacts to broader heritage context are not expected.

There are no buildings on or close to the study area apart from station buildings at Drennan which are typical railway buildings built after the mid-twentieth century. These are mostly in very poor condition, some occupied by farm workers, others vandalised and stripped.

Table 4: Impacts to Landscape and Setting

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long-term	Long-term
Intensity	Low	Low
Probability	Low	Low
Confidence	Medium	Medium
Significance	Low	Low
Nature of cumulative impact	None	
Can impact be reversed?	Yes, after facility is decommissioned	
Impact may cause irreversible loss of resources	The visual impact of the proposed development on the farm N10 must be assessed by the Visual Impact Specialist.	
Can impact be mitigated?	Yes, the Visual Impact Specialist will indicate if this is required.	

7.5 Heritage Objects

The remains of an abandoned car (circa 1920 vintage) lie to the southern side of the site. While not of major significance it is protected under the NHRA and should be left in-situ.

8. MITIGATION

8.1 Palaeontology

The site should be inspected by a palaeontologist before disturbance, thereafter bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary.

Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included within the brief of the appointed palaeontologist.

Any material recovered will be lodged in the collections of Iziko South African Museum or a regional museum with suitable curatorial capacity.

8.2 Archaeology

The area presently identified for the proposed activity is acceptable, provided that a moderate amount of mitigation is undertaken.

Stone cairns DRN 11 and DRN 14

The two possible graves automatically get a high significance rating in heritage terms as they are covered by legislation at national level and the procedures for their exhumation are long and onerous. It is recommended that a 10 m buffer zone be implemented around each potential grave and they are left undisturbed.

Or

A permit for exhumation of the graves be applied for and the contents of the graves be subject to basic forensic assessment and be relocated. The process of exhumation will require consultation with interested parties which will need to include local residents and Khoisan interest groups (who have become quite well established in the Eastern Cape). The process can take in excess of 4 months to obtain a permit.

Pre-colonial kraal DRN 13 (wpt 13-25)

The pre-colonial stone kraal is good example of its kind and should be considered to be worthy of a grade IIIA rating (which means of high local significance) on account of its complete and original condition. The following mitigation measures could be applied:

- The kraal could be destroyed; the kraal must be thoroughly recorded by a qualified archaeologist by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition (a permit may not be granted).;
- The kraal could be avoided and left in-situ within a 10 m radius of exclusion from the perimeter of the kraal; or
- The kraal could be avoided from development, left in-situ and conservation action implemented by a qualified archaeologist including recording and documenting the site.

The last option is the preferred and recommended option yielding a Medium positive impact significance.

Historic kraal DRN 15

The historic kraal is of a form which is well represented in the Karoo and not considered especially important. Under ideal circumstances it should be conserved, however should it be necessary to demolish it, this can be done under a demolition permit issued by ECPHRA. The following mitigation measures could be applied:

- The kraal could be destroyed; the kraal must be thoroughly recorded by a qualified archaeologist by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition;
- The kraal could be avoided and left in-situ within a 10 m radius of exclusion from the perimeter of the kraal; or
- The kraal could be avoided from development, left in-situ and conservation action implemented by a qualified archaeologist including recording and documenting the site.

The last option is the preferred and recommended option yielding a Medium positive impact significance.

In general, it is recommended that should the proposed project be authorised, an archaeologist should as part of the environmental management plan conduct a second site visit to mark out the areas of sensitivity with coloured flags so that these can be avoided during construction activities if this course of action is chosen.

Other areas

A cautionary note is issued: the Fish River facing slope is archaeologically sensitive and should be considered a no go area – no access roads, fences or human intervention. In this area there are numerous stone features that appear to make up a complex of pre-colonial kraals.

9. REFERENCES

Booth, C. 2011. An archaeological desktop study for the proposed 200MW wind energy facility near Aberdeen, Camdeboo Local Municipality, Eastern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Deacon, H.J. 1976. Where Hunters Gathered: a study of Holocene Stone Age people in the Eastern Cape. South African Archaeological Society Monograph Series No 1.

Fransen, H. 2006. Old towns and villages of the Cape. Cape Town: Jonathan Ball Publishers.

Hart, TJG., 1987. Haaskraal and Volstruisfontein. Later stone age event in the Seekoei Valley. University of Cape Town: Unpublished MA.

Logie, B. 2008. Dusty Road to Long Ago. Bluecliff Publishing: Port Elizabeth.

Moir, R.W. & Sampson, C.G. 1993. European and Oriental ceramics from rock shelters in the Upper Seacow Valley. *Southern African Field Archaeology* 2:35-43.

Neville, D., Sampson, B.E. & Sampson, C.G. 1994. The frontier wagon track system in the Seacow River Valley, North-Eastern Cape. *South African Archaeological Bulletin* 49: 65-72.

Sampson, CG., 1988 Stylistic boundaries among mobile hunter-gatherers in the Zeekoe Valley, Eastern Cape. *Washington, Smithsonian Institution Press.*

Sampson, C.G., Sampson, B.E. & Neville, D. 1994a. An early Dutch settlement pattern on the north east frontier of the Cape Colony. *Southern African Field Archaeology* 3: 74-81

Sampson, C.G. & Sampson, B.E. 1994b. Nineteenth century survey diagrams of the Seacow River Valley. *Martevaan* 11:1-15.

Webley, L. & Hart, T. 2010. Scoping Archaeological Impact Assessment: Proposed prospecting on Denmark 119 and Groene Vallei 226 North and South (Site 37), Cradock, Eastern Cape. Unpublished report for Tasman Pacific Minerals Limited.

The Surveyor Generals Office, Cape Town.

Appendix 1: Drennan archaeological findings.

Introduction

The archaeology of the Eastern Karoo is rich but not widely studied. Thanks to the lifelong work of Garth Sampson and his students, the archaeology of parts of the central karoo has be described. Sampson commenced his research in the area that was to be affected by the Orange River Scheme in the early 1960's (among the first heritage rescue archaeology projects ever done in South Africa) excavating a number of rock shelters in the catchments of the great dams of the Orange River. From the information he gained he was able to make the first descriptions of the regional sequence of human settlement and wrote a number of monographs on the subject in subsequent years. In the 1980's he commenced the biggest archaeological survey in Africa which was set in the Zeekoe River Valley roughly between the towns of Nieuwbethesda and Hanover, Richmond and Middleberg. The work is still in progress and is considered to the last word on the archaeology of the region. The study area situated near Cradock is close enough for Sampson and several generations of post-graduate students work to be directly relevant.

Sampson's summary of findings contained in his atlas of Stone Age Settlement in the Upper Sea Cow River Valley documents a long sequence of successive Stone Age industries dating back from the Early Stone Age (in excess of 250 000 years ago) to the proto-historic period when the Karoo was temporarily occupied by Khoekhoen herding groups, broken up "bushman" communities who were gradually displaced by the advance of the Trekboers.

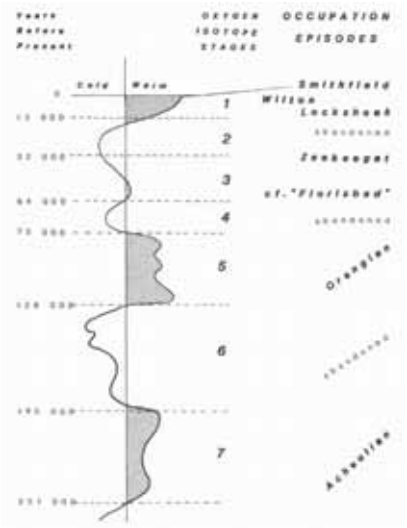


Figure 1 The occupation sequence of the great Karoo proposed by Garth Sampson

The archaeology of the Drennan site falls in neatly with Sampson's findings. Sampson and his team from Southern Methodist University were the first archaeologists to document the pre-colonial stone kraals associated with a Khoekhoen cultural in South Africa. This was the first conclusive proof the archaeology of the highly mobile khoisan speaking herding people was visible on the South African landscape. One of his postgraduate students, Tim Hart studied the stone kraals in depth and was able to tentatively date the appearance of herding groups in the great Karoo to the mini-ice age of around 1400 AD when the climate enjoyed a wet spell and the Karoo was probably grassland dominated to the extent that could support both sheep and cattle. In subsequent years Hart and others have observed stone kraals in the high Karoo near Sutherland, the Moodenaars Karoo and on the Great escarpment showing that this early farming occupation of the Great Karoo was a much wider phenomenon than originally thought. It must be noted that these ephemeral stone kraals take a practised eye to see, and are easily distinguishable from the much more robust circular and square European origin kraals (circular and square) that are to be found on almost every karoo farm.

Drennan findings

The site survey which covered a much wider area than the proposed portion of land to be used for the proposed photovoltaic facility revealed the presence of a number of early kraals and kraal complexes that are commensurate with those described by Sampson (1985) and

Hart (1987). This information was immediately passed on to ERM with the result that the boundary of the study area could be adjusted to mainly avoid the kraal complex, hence the findings within the proposed project area have been reduced. Nevertheless there remain a few significant archaeological sites within the study area including a really well preserved prehistoric kraal. Most of the prehistoric kraals are mainly situated just back from the low ridge which overlooks the Drennan station and housing. Several have been disturbed by some small-scale historical stone quarrying which we assumed was to source raw material for construction of the historic railwayman's cottage (used as a hunting lodge) on an adjacent piece of land. An inventory of the findings is presented below.

DRN 04 (wpt 4)
A circular stone alignment of approximately 8x5 m of piled stone (not coursed walling) which is in appearance typical of pre-colonial stone kraals described by Sampson 1985 and Hart 1987.

DRN 05 (wpt 5)
A stone "kraal" similar to the above but smaller. Present are sundry stone piles and cairns.

DRN 06 (wpt 6)
A possible stone kraal on the edge of the ridge which has been partially destroyed by a historic quarry.

DRN 07 (wpt 7)
A rock shelf on the edge of the ridge that stretches along the ridge for about 30 m. There is clear evidence of blocks being cut out suggesting this is an historic quarry.

DRN 08 (wpt 8)
A small sunken stone enclosure – deposits have increased in depth on the outside edges over time. This is likely to be a pre-colonial stock pen.

DRN 09 (wpt 9)
A "classic" Khoekhoe kraal typical of those seen in the upper karoo and as far as Namaqualand. This one (piled stone) is about 10 m in diameter, has a smaller enclosure near its entrance which is ethnographically similar to what the Nama term a "lammerkraal".

DRN 10 (wpt 10)
A piled stone alignment that may have been part of a kraal.

DRN 11 (wpt 11) ***Within the study area***
A formal stone pile that has been damaged by an aardvark excavation. This is typically what happens to graves in this area. The site is likely to be a pre-colonial burial site associated with the kraal complex.

DRN 12 (wpt 12)
A well-formed stone kraal of about 5 m diameter.

DRN 13 (wpt 13-25) ***Within the study area***
A very large and well preserved pre-colonial kraal with a "lammerkraal" at its entrance (15x15m). This is the best preserved example on the site and lies within the study area.

DRN 14 (wpt 26) ***Within the study area***
Stone feature- a possible pre-colonial grave.

DRN 15 ***Within the study area***. An historic stone kraal.

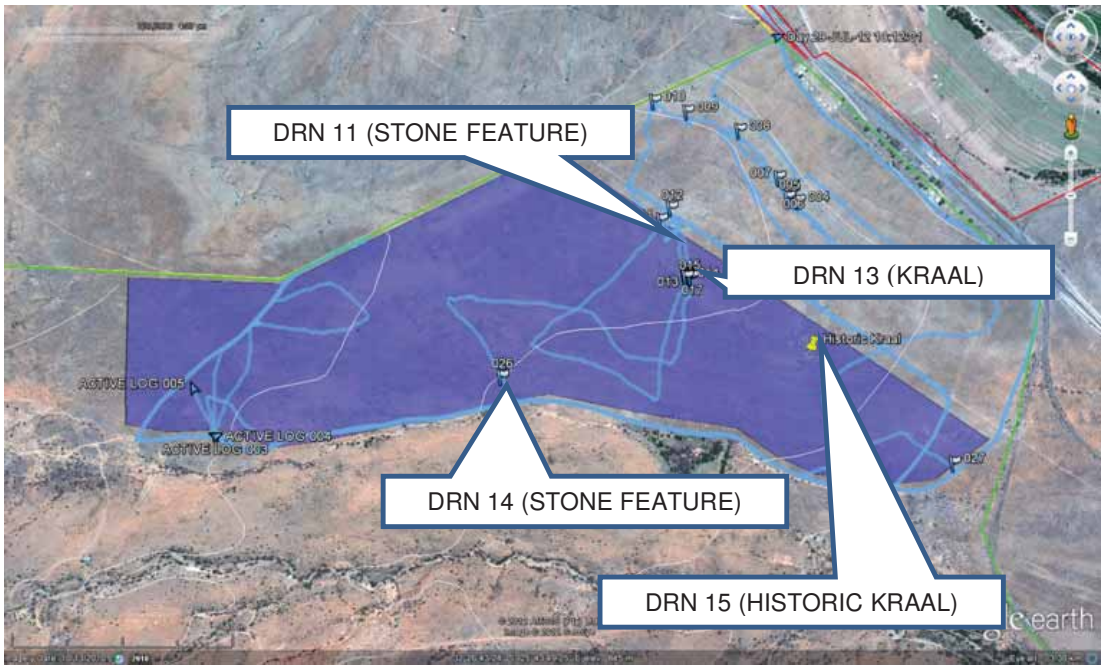


Figure 2: Location of archaeological finds within the study area

Recommendations for mitigation

Stone cairns DRN 11 and DRN 14
The two possible graves automatically get a very high significance rating in heritage terms as they are covered by legislation at national level and the procedures for their exhumation are long and onerous. It is recommended that a 10 m buffer zone be implemented around each potential grave and they are left undisturbed.

or

A permit for exhumation of the graves be applied for and the contents of the graves be subject to basic forensic assessment and be relocated. The process of exhumation will require consultation with interested parties which will need to include local residents and Khoisan interest groups (who have become quite well established in the Eastern Cape). The process can take in excess of 4 months to obtain a permit.

Pre-colonial kraal DRN 13 (wpt 13-25)
The pre-colonial stone kraal is good example of its kind and should be considered to be worthy of a grade IIIA rating (which means of high local significance) on account of its complete and original condition. The best mitigation scenario is that it is conserved in-situ within a 10 m radius of exclusion from the perimeter of the kraal.

or

The kraal must be thoroughly recorded by an archaeologist by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition.

Historic kraal DRN 15
The historic kraal is of a form which is well represented in the Karoo and not considered especially important. Under ideal circumstances it should be conserved, however should it be necessary to demolish it, this can be done under a demolition permit issued by the Eastern Cape Provincial Heritage Resources Authority.

In general, it is recommended that should the proposed project be authorised, an archaeologist should as part of the environmental management plan conduct a second site visit to mark out the areas of sensitivity with coloured flags so that these can be avoided during construction activities.

Other areas
A cautionary note is issued: the Fish River facing slope is archaeological sensitive and should be considered a no go area – no access roads, fences or human intervention.

Conclusion

The Drennan kraal complex is part of what appears to be a Karoo wide phenomenon that is associated with certain kinds of landscape. Unfortunately archaeological knowledge of the kraal phenomenon remains in its early stages. A great deal more research is need on the general spatial distribution of these herder sites, however indications are that certain environments were favoured, notably escarpments and high lying areas.

While the Drennan area is archaeological interesting, much of the study area is located outside the area of archaeological interest. There are unfortunately 3 areas of high importance that are situated within the study area – namely two potential grave sites, a pre-colonial stone kraal and an historic Kraal. Provided that these sites, which are of limit size are mitigated or conserved, the project is considered acceptable in archaeological terms.

Figure 3: DRN 13 A piled stone kraal typical of those previously described in the central Karoo.

Figure 4: DRN 14 A possible burial cairn

Figure 5: DRN 11 A possible burial cairn that has been opened by Aardvarks.

Palaeontological Assessment proposed Project on Waai Plaats Drennan (3225BC Mortimer)

Prepared by

Graham Avery
(Sole Proprietor)

Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology

May, 2013

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Executive Summary

Graham Avery was commissioned by Tim Hart, ACO-Associates cc on behalf of their client to conduct a field and desk top survey of the palaeontological potential of the proposed Drennan Project (herein referred to as the Drennan Site).

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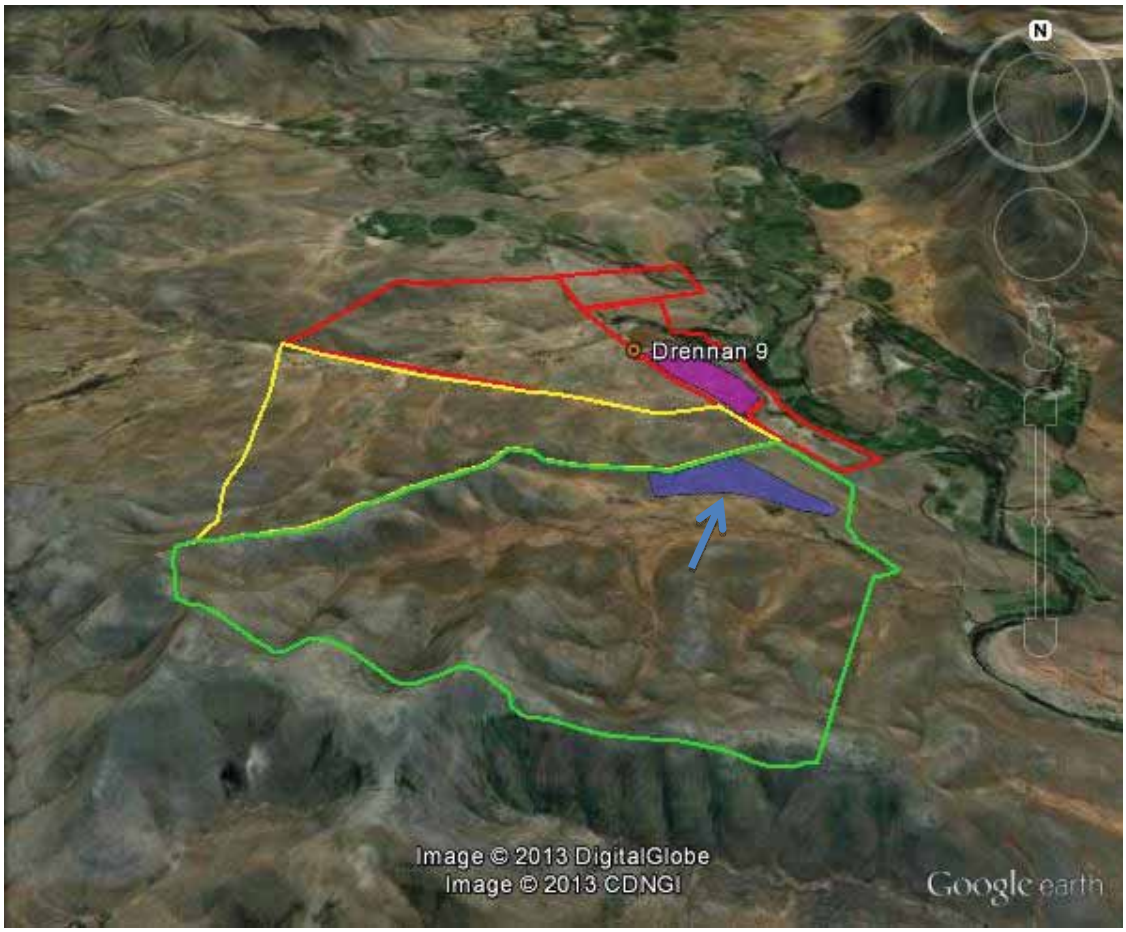
The proposed site is located in a palaeontologically-sensitive region with a hard rock base of the potentially fossiliferous Permian (circa 250 Ma (million years old) Balfour Formation and more recent (circa 20 Ma to the present) alluvial sediments, which may also contain fossil and sub-fossil remains. Any excavation for foundations and/or infrastructure that penetrates into underlying older rocks or sediments may encounter fossils. Fossil finds would be significant and would require careful recording and possible systematic excavation. Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enable observations to be made about our past biodiversity and environments.

Collaboration between the contractor and a suitably-qualified palaeontologist will be required prior to and during construction excavations so that palaeontological information and/or material can be recorded. Mitigation may extend beyond monitoring if warranted.

Provided that the recommendations of this assessment are complied with, there is no palaeontological reason why the proposed development should not proceed.

Location of the Proposed Sites

The proposed area falls on 1:50 000 topographical map 3225BC Mortimer, 32°26'41.42" S; 25°43' 54.89" E (centre point)**.** Detail is shown on Figures 1, 2.



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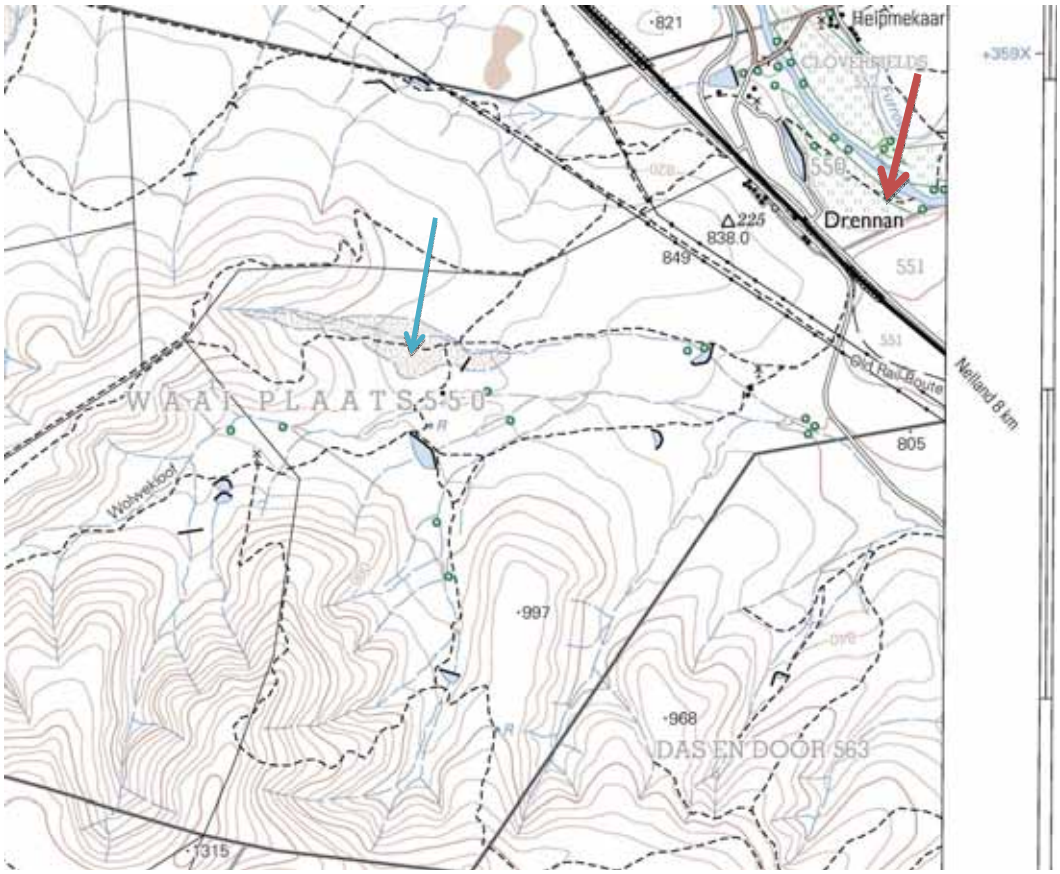

Figure 2. Location of Drennan Station (red arrow) and proposed site area (blue arrow).

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As requested, a desk top study of the proposed Drennan site area was conducted by Dr G. Avery Archaeozoologist (Figures 1, 2). The 1:250 00 Geological Series 3318 Cape Town map was consulted for background information (Figure 3).

The focus here has been to illustrate the potential of sub-surface sediments through the geological context and observations in the general vicinity.

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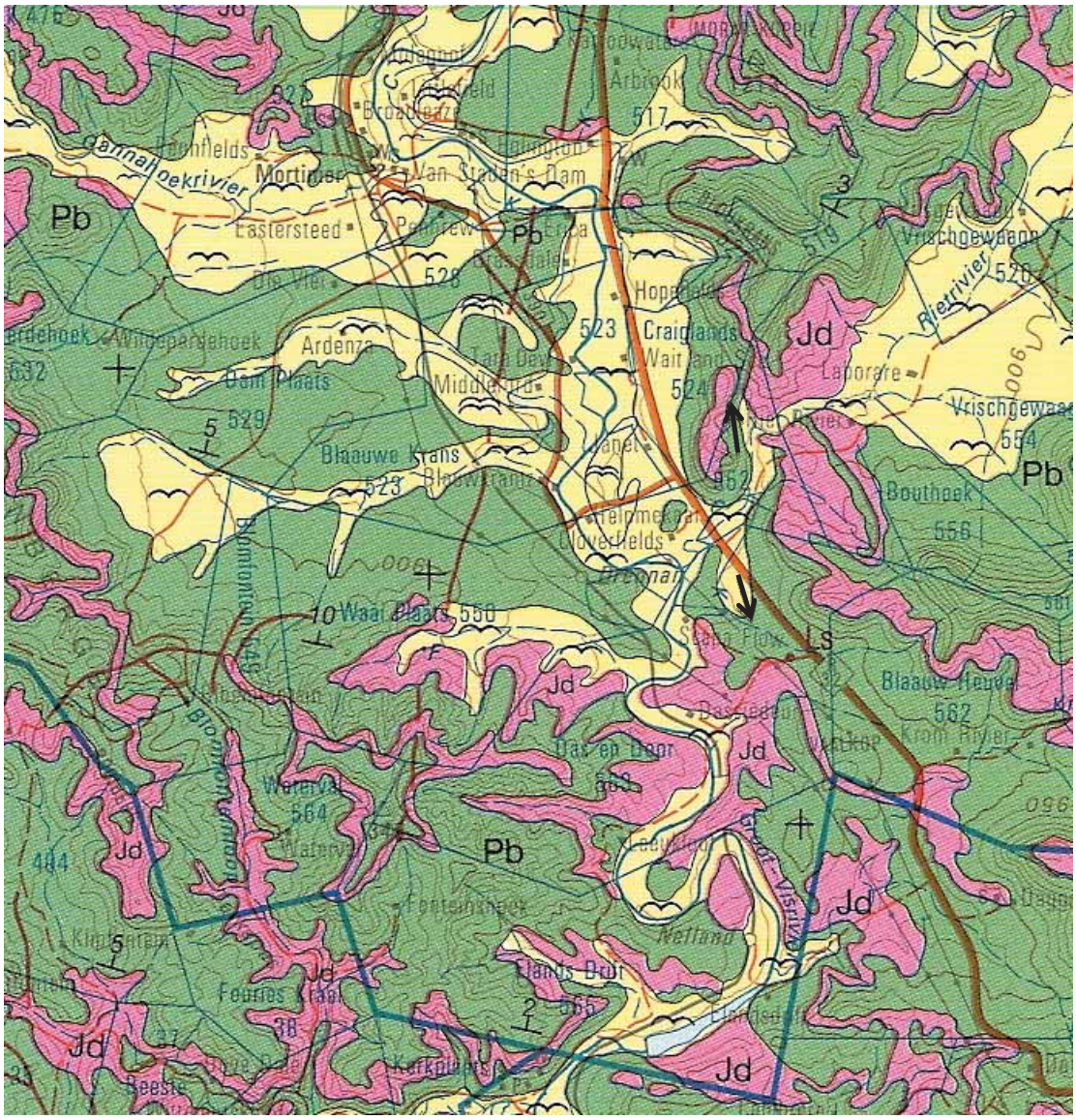
Geology and lithology

The geology of the area is shown on Figure 3, which describes the ancient hard rocks of the Karoo Group Balfour Formation (250 Ma (million years old) and more recent alluvial sediments of Late Tertiary Neogene Period (Miocene, Pliocene Epochs (20 to 2.6 Ma) to Quaternary Period (Pleistocene to Holocene Epochs (2.6 Ma to Present).



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Description of proposed site

The Drennan study area is generally flat, with a grass-and scattered small bush-covered rocky surface (Figures 4-6).

Figure 4. Example of the landscape on the proposed Drennan Site (Photo: T. Hart).

Figure 5. View from the proposed Drennan Site towards the Great Fish River Valley (Photo: T. Hart).

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Palaeontological Potential

The Drennan Site is situated in a palaeontologically sensitive and important area of the ancient Karoo Basin (Johnson, et al. 2009; Rubidge, et al. 1995; Smith 1990).

"The Karoo Supergroup covers almost two thirds of the present land surface of southern Africa. Its strata record an almost continuous sequence of continental sedimentation that began in the Permo-Carboniferous (280 Ma) and terminated in the early Jurassic 100 million years later. The glacio-marine to terrestrial sequences accumulated in a variety of tectonically controlled depositories under progressively more arid climatic conditions. Numerous vertebrate fossils are preserved in these rocks, including fish, amphibians, primitive aquatic reptiles, primitive land reptiles, more advanced mammal-like reptiles, dinosaurs and even the earliest mammals" (Smith 1990).

Fossilized plant remains are common in parts. Iziko South African Museum's Karoo Palaeontology section holds Balfour and Katberg Formation vertebrate and plant fossils from the Cradock area in its collection (S. Kaal, Iziko Museums of South Africa, pers. comm.).

Thus, excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enable observations otherwise impossible to be made.

No reference to surface palaeontological material specifically on the Drennan Site was found, although fossils have been recorded in the Cradock area. Since the proposed Drennan Site has been disturbed, the surface potential of the proposed Drennan site may be minimal, although it is not possible to exclude the possibility that fossils do occur there. It is possible that fossils or sub-fossils of interest could be encountered during any excavation that cuts into underlying older hard rock and alluvial sediments.

In addition to the potential within the Balfour Formation rocks, small pockets of bone can occur, for instance, where bone accumulators like hyaenas, Jackals or porcupines used holes/burrows dug by aardvarks; older and younger younger sediments, too, may contain ancient wetland deposits and/or more-recent fossils. In addition to fossil bones and molluscs, there is the potential for encountering macro-plant remains and pollens of considerable age in wetland deposits. Thus, foundations excavated into rocks and sediments on the Drennan Site may intersect fossil-bearing deposits. If so, there is the potential to provide opportunities for observations not otherwise accessible to researchers.

Such probabilities could be better assessed if location of units and geotechnical information and details of the depth to which any excavations will extend, were available. They would greatly assist in assessing estimating whether and where monitoring may be necessary during construction.

Comments

Based on its geology and regional finds in Iziko Museums of South Africa, the Drennan site has palaeontological potential. However, with limited information available on the recorded occurrence of fossils on the proposed site, good communication with contractors and on-site monitoring during excavations will be required to minimise any potential loss.

More systematic mitigation may be required if the context of any fossil material encountered warrants more than just recording and collection.

Conclusion

While no direct fossil evidence was found for the Drennan site, this does not mean that potential is lacking. Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enables observations to be made on geology, past sea levels, climates, environments and biodiversity, that would otherwise be impossible.

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Given the palaeontological potential of the area, mitigationary action, beyond simple recording and recovery during monitoring, including the possibility of systematic excavations, may be necessary.

Provided that the recommendations in this report are followed, current information indicates that the proposed development will not impact significantly on palaeontological remains. Appropriately conducted the development may provide opportunities to access rare fossil material and to better understand the local geological sequence.

Provided that the recommendations herein are adhered to the proposed development can be allowed to proceed from the palaeontological perspective.

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Bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

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Dr Graham Avery MRSSAf
Curator, Natural History Cenozoic Collections (retired)
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Honorary Associate: Iziko Museums of South Africa, Natural History Collections Department
Honorary Research Associate: University of Cape Town, Archaeology Department

25 San Bernado
28 De Lorentz Street
Gardens 8001
Cell: 0834410028
Landline: +27 21 4241285
Email: gavery@iziko.org.za; dr.g.avery@gmail.com

Palaeontological Assessment proposed Project on Drennan (3225BC Mortimer)

Prepared by

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May, 2013

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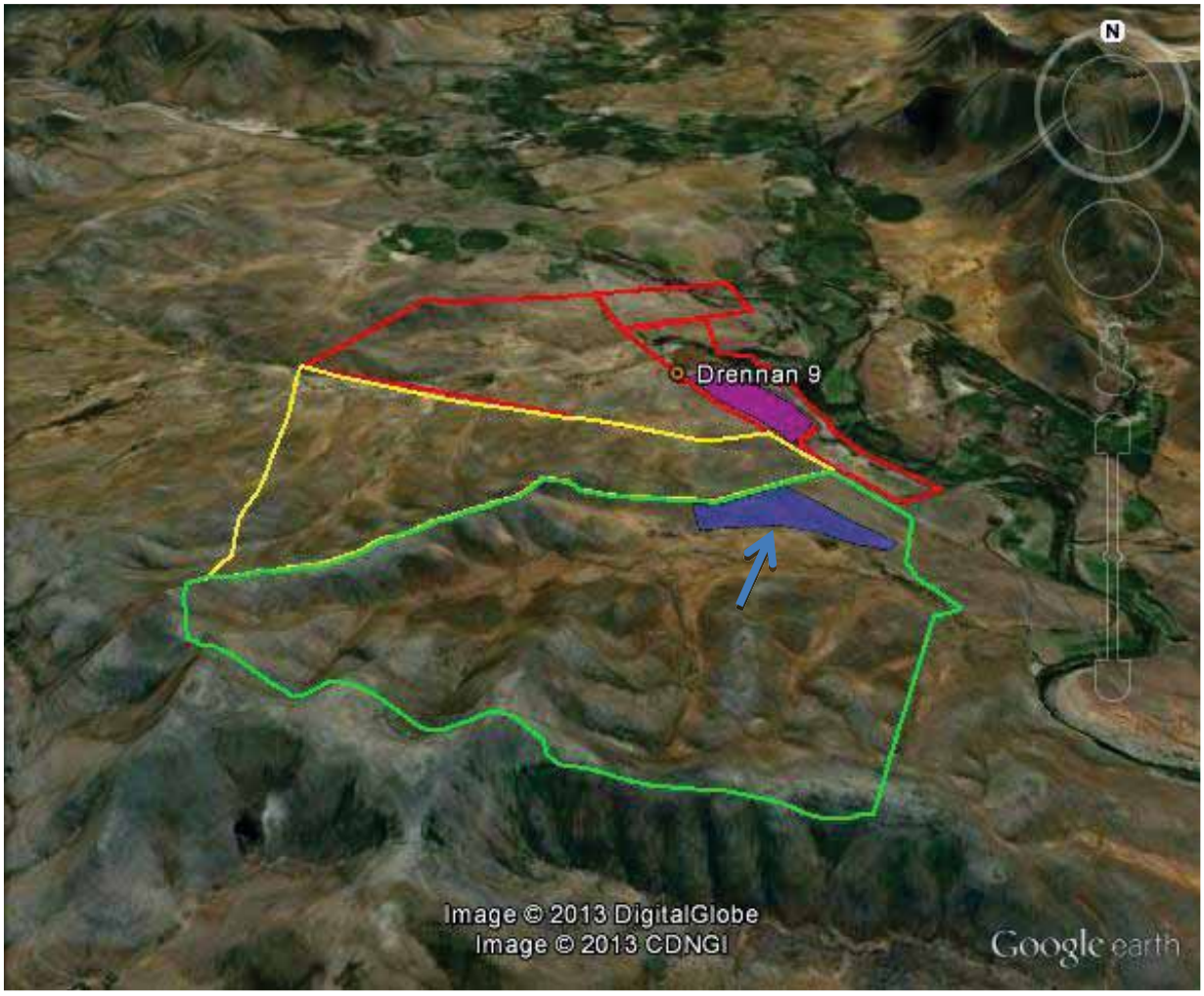

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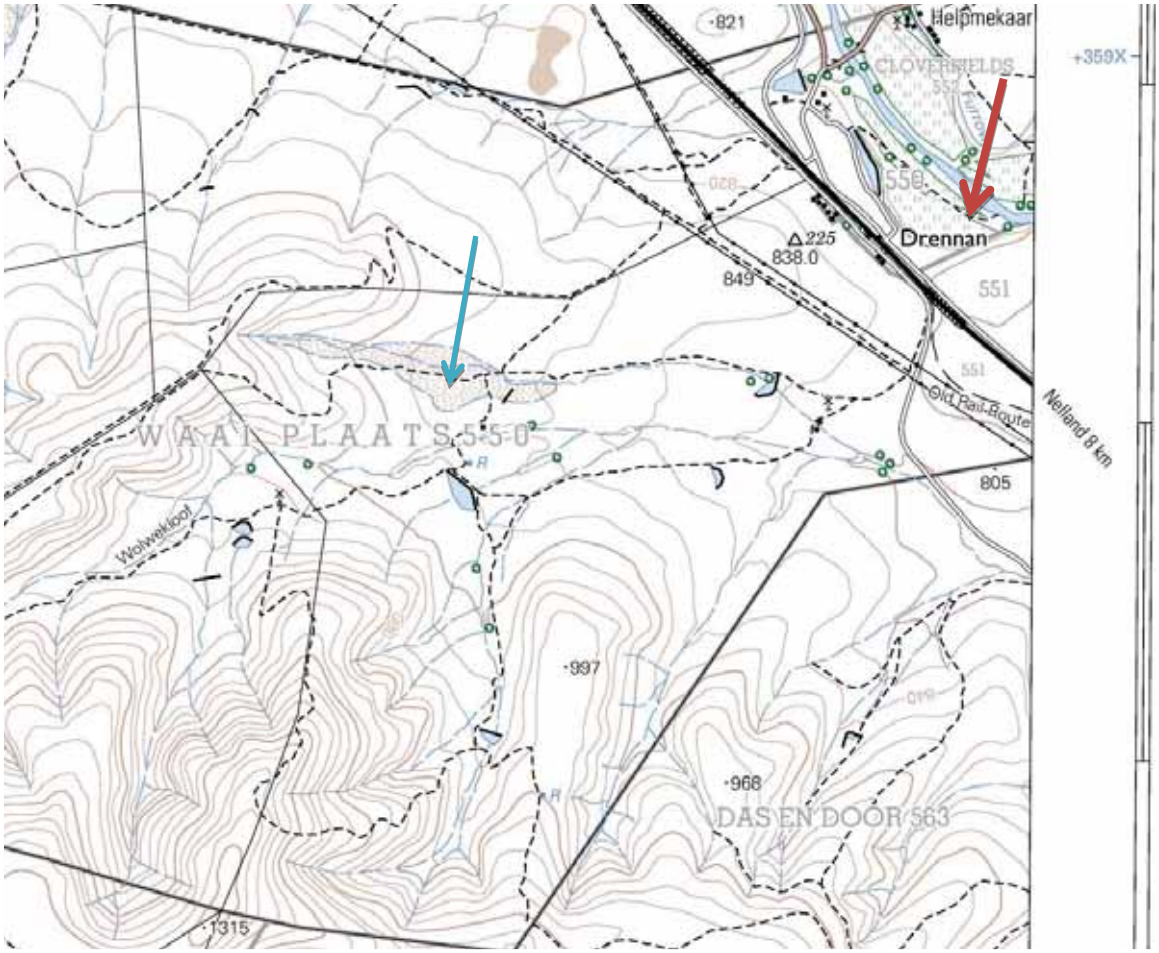

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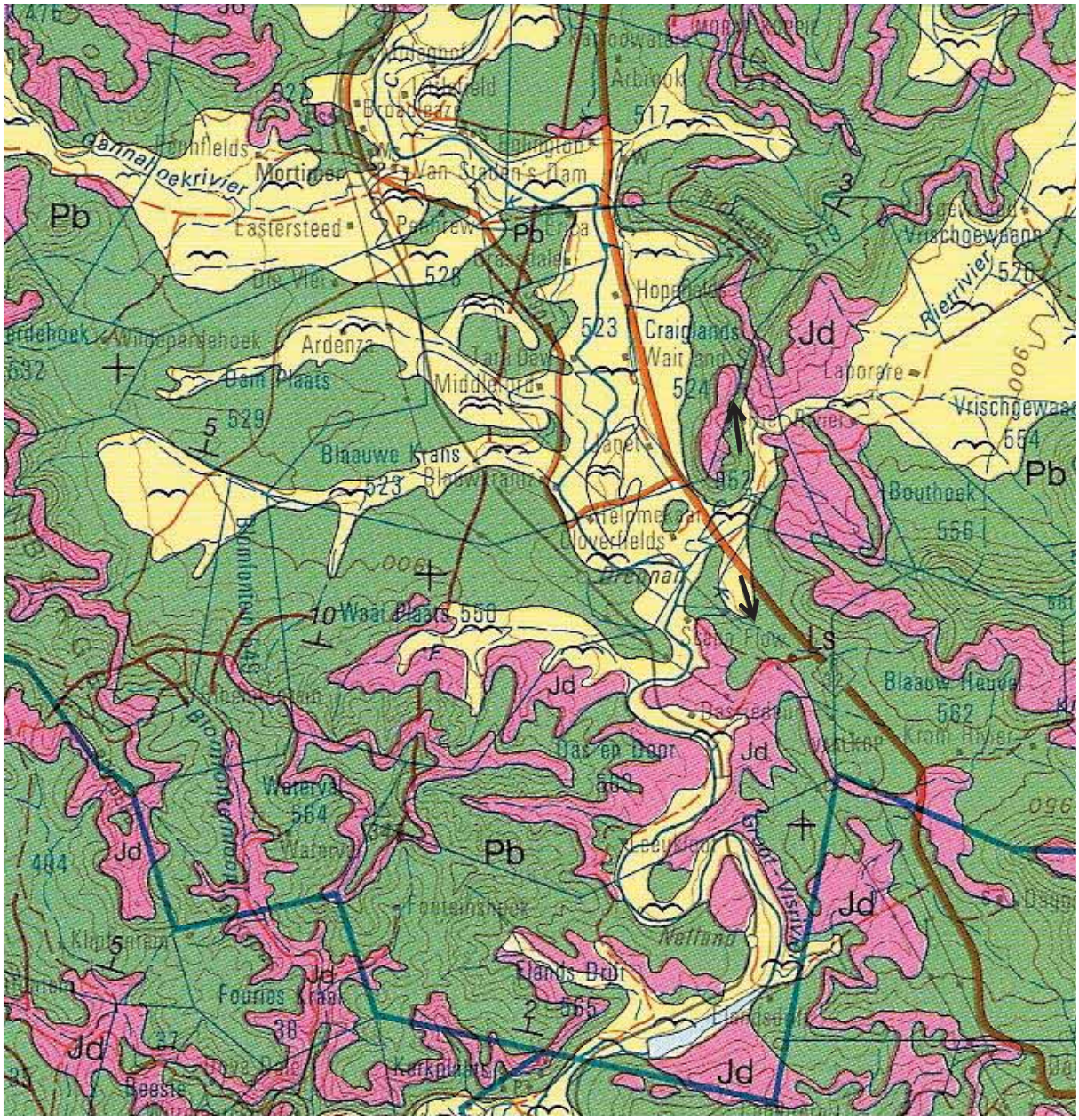

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25 San Bernado
28 De Lorentz Street
Gardens 8001
Cell: 0834410028
Landline: +27 21 4241285
Email: gavery@iziko.org.za; dr.g.avery@gmail.com

Annex H

Visual Specialist Report

DRAFT

VISUAL IMPACT ASSESSMENT

PROPOSED DRENNAN PV SOLAR PARK, EASTERN CAPE PROVINCE

June 2013

Prepared for:
ERM Cape Town
2nd Floor, The Great Westerford
240 Main Road, Rondebosch
Cape Town 7725

Visual Resource Management Africa cc
PO Box 7233, George, 6531
Tel: +27 44 876 0020/ Fax: +27 86 653 3738
Cell: +27 83 560 9911
E-Mail: steve@vrma.co.za
Web: www.vrma.co.za

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This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, South Africa. VRM Africa cc was appointed as an independent professional visual impact practitioner to facilitate this VIA.

This document was undertaken by the following team:

Stephen Stead	Director/ Visual Impact	APHP accredited VIA Practitioner
Heather Stead	Research/ Assistant	Bachelor of Arts
Lisa Shultz	Editing and Contrast Rating	Bachelor of Arts, Fine Art

Stephen Stead has 12 years of experience in the field of GIS mapping and 3D modelling through his work as a GIS consultant and visual impact practitioner.

Stephen Stead
APHP accredited VIA Specialist

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ACRONYMS

ACEC	Areas of Critical Environmental Concern
APHP	Association of Professional Heritage Practitioners
BLM	Bureau of Land Management (United States)
BPEO	Best Practicable Environmental Option
CALP	Collaborative for Advanced Landscape Planning
DEA&DP	Department of Environmental Affairs and Development Planning (South Africa)
DEM	Digital Elevation Model
DoC	Degree of Contrast
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographic Information System
IAIAsa	International Association of Impact Assessment, South African Affiliate
I&APs	Interested and Affected Parties
IEMA	Institute of Environmental Management and Assessment (United Kingdom)
KOP	Key Observation Point
LRC	Lighting Research Centre
MAMSL	metres above mean sea level
NELPAG	New England Light Pollution Advisory Group
ROD	Record of Decision
SAIEA	Southern African Institute for Environmental Assessment
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
VAC	Visual Absorption Capacity
VE	Visual Envelope
VIA	Visual Impact Assessment
VRM	Visual Resource Management
ZVI	Zone of Visual Influence

GLOSSARY

Best Practicable Environmental Option (BPEO)
This is the option that provides the most benefit, or causes the least damage, to the environment as a whole, at a cost acceptable to society, in the long, as well as the short, term.

Cumulative Impact
The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Impact (visual)
A description of the effect of an aspect of a development on a specified component of the visual, aesthetic or scenic environment, within a defined time and space.

Issue (visual)
Issues are concerns related to the proposed development, generally phrased as questions, taking the form of "what will the impact of some activity be on some element of the visual, aesthetic or scenic environment?".

Key Observation Points (KOPs)
KOPs refer to receptors (people affected by the visual influence of a project) located in the most critical locations surrounding the landscape modification, who make consistent use of the views associated with the site where the landscape modifications are proposed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail or river corridor.

Management Actions
Actions that enhance the benefits of a proposed development, or avoid, mitigate, restore or compensate for, negative impacts.

Receptors
Individuals, groups or communities who would be subject to the visual influence of a particular project.

Sense of Place
The unique quality or character of a place, whether natural, rural or urban.

Scenic Corridor
A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route.

Scoping
The process of determining the key issues, and the geographic boundaries and time boundaries, to be addressed in an environmental assessment.

Viewshed
The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed. This reflects the area in which, or the extent to which, the landscape modification is likely to be seen.

Zone of Visual Influence (ZVI)
The ZVI is defined as 'the area within which a proposed development may have an influence or effect on visual amenity.'

1 EXECUTIVE SUMMARY

VRM Africa was appointed by ERM to undertake a Visual Impact Assessment (VIA) for undertake a Visual Impact Assessment (VIA) for **Drennan Photovoltaic (PV) Solar Park** in the Eastern Cape. ERM has been sub-contracted by Solaire Direct Southern Africa (Pty) Ltd to undertake the Scoping/EIA process for this project. The proposed site is located on Portion 15, of Portion 1, of the Farm Waai Plaats (no. 550) at Drennan in the Inxuba Yethemba Local Municipality, Eastern Cape. It is anticipated that the project will feed a total of 90MW into the national grid.

The scope of the VIA covers the entire affected project area. This includes an inspection of the full site extent and a brief assessment, including the following:

- Quantifying and assessing the existing scenic resources/ visual characteristics on, and around, the proposed site.
- Evaluating and classifying the landscape in terms of sensitivity to a changing land use.
- Reviewing the legal framework that may have implications for visual scenic resources.

The site is 28 km South of Cradock, approximately 3 km west off the N10 and is accessible via the R390. The area is dominated by a series of parallel mountain ranges, running east to west, that have a profound effect on the natural vegetation and the subsequent biome diversity of the area. The Winterberg Mountain range and the fertile Fish River Valley dominate the area.

Cradock is on the eastern edge of the Karoo, near the headwaters of the Great Fish River (Nxuba River), and it is a dry and barren area, dominated by flat-topped hills and wind-swept plains. Cradock is one of the Cape's main centres of the wool industry, and also produces beef, dairy, fruit, lucerne and mohair. In the neighbouring Mountain Zebra National Park, a few herds of the now-protected mountain zebra survive.

A site landscape character assessment was undertaken from five locations to assess the scenic quality, receptor sensitivity to landscape change and receptor distance to the proposed landscape modifications. The site is designated for agricultural use, with current agricultural practices including grazing for livestock (cattle, sheep). The geographic extent of the area would be local (limited to the immediate surroundings).

Due to topographic undulation, the viewshed is constrained to the valley area and mainly within the six kilometre foreground/middle ground area, but would also extend further to the east on the raised ground areas of the eastern mountains. The undulating terrain further afield would reduce the clarity of the views, as seen from the mobile receptors. Due to the undulating terrain surrounding the site, as well as the predominantly south facing aspect of the majority of the site which is topographically screened from most of the more northern receptors, the visibility of the project is defined as *moderate to low.*

Making use of the viewshed the following community points would be exposed to the proposed project and would need to be assessed to ascertain if, and where, they fulfill Key Observation Point criteria:

- The N10 road;
- The R390 road; and
- The Drennan farming communities to the north and east of the site, mainly making use of the Witmos – Mortimer road.

Due to the close proximity of these receptors which are also located mainly to the north, only the N10 was utilised as a Key Observation Point as the contrast descriptions for the other location would be very similar if not exactly the same.

Based on the VRM Matrix, Visual Management Classes were defined for each of the sites. The site was surveyed for scenic quality and receptor sensitivity to landscape change at five points located on the property and the following landscapes were defined and described:

- *Mountain, Hills and Steep Slopes:* These areas are steep slope areas which would require some degree of development constraint. They would have higher biodiversity due to their remoteness, and would be a draw card for existing and future eco-tourism activities in this area. In order to protect the visual resources of this mountain landscape it is recommended that a Class II visual objective be met, and that landscape modification, as seen from the receptors in this area, are subjected to low levels of visual intrusion.
- *Drainage lines and Gullies*: With moderate scenic quality and receptor sensitivity to landscape change but with receptors located within the foreground distance zone, a VRM Class III was assigned to the site. However, due to the drainage lines located in the area which are prone to erosion and subsequent visual decay, a Class II was assigned in order to ensure that limited landscape modification took place.
- *Infrastructure: Railway and Powerlines:* The landscape forms associated with these infrastructural elements are mostly flat, but do have some interesting characteristics where it cuts through the topography and where some variety in vegetation occurs, mostly associated with the station and cluster development where colour is evident. The adjacent scenery definitely enhances the visual quality, even though the setting is fairly common within the region. Public interest would be low and most users would have a low concern for these landscape features. Maintenance of visual quality would be high. A Class IV rating was assigned to these landscape features.

Using the ERM impact criteria, a significance rating was undertaken for the following visual aspects:

- PV Plant Alternatives
- Transmission Lines and Substations
- Cumulative Impacts

Visual impact significance is predicted to be ***moderate to minor*** with effective implementation of mitigations. Should the project be granted permission, care should be taken regarding cumulative visual impacts of the project attracting other PV projects to the area. This could change the current authentic agricultural landscape which has *moderate to high* scenic quality and adds to the visual experience of receptors utilising the N10 national road. An Environmental Management Plan should be implemented, and mitigation measures must be effectively undertaken relating to:

Construction Phase

- Keeping contract period to the minimum
- Traffic control measures
- Disposal of surplus materials
- Location of lay-down areas
- Dust management plan
- Environmental Management Plan

Operational Phase

- Height, location, finishes of building(s)
- Use of non-reflective materials and receding colours
- Discussions with local community

Closure Phase

- Removal of all PV structures, associated structures and infrastructure
- Rehabilitation and restoration

2 INTRODUCTION

VRM Africa was appointed by Environmental Resources Management (Southern Africa) Pty Ltd (ERM) to undertake a Visual Impact Assessment (VIA) for **Drennan Photovoltaic (PV) Solar Park** in the Eastern Cape. ERM has been sub-contracted by Solaire Direct Southern Africa (Pty) Ltd to undertake the Scoping/EIA process for this project. The proposed site is located on Portion 15, of Portion 1, of the Farm Waai Plaats (no. 550) at Drennan in the Inxuba Yethemba Local Municipality, Eastern Cape. The site is 28 km South of Cradock, approximately 3 km west off the N10 and is accessible via the R390.

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 targets and goals the South African government has set out, and contribute to climate change mitigation.

''The Renewable Energy Independent Power 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.'' (ERM Solaire Direct 2012)

It is anticipated that the project will feed a total of 90MW into the national grid. The proposed development footprint and layout map have not yet been provided to VRM Africa.

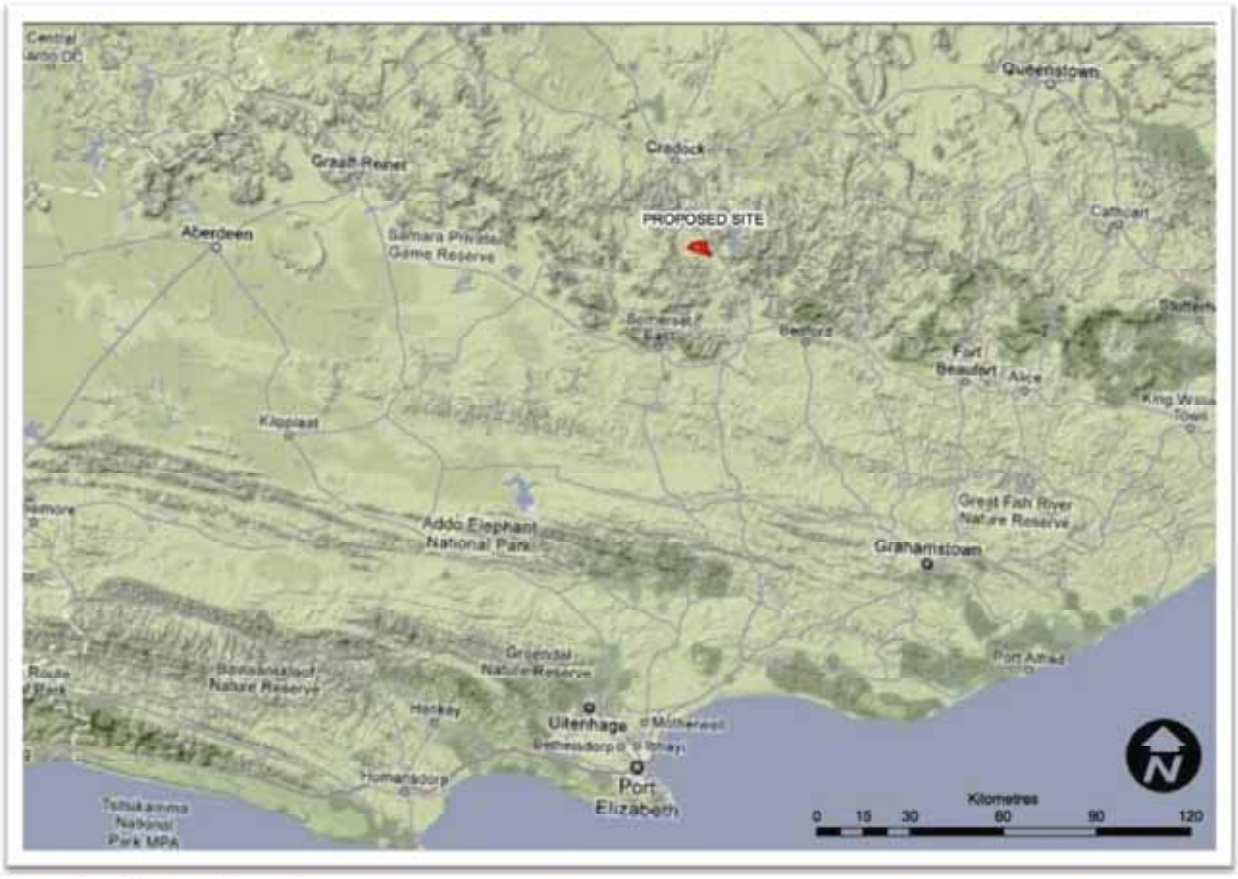


Figure 1: Regional location map

3 APPROACH TO STUDY

3.1 Terms of Reference

- The scope of the study is to cover the entire affected project area. This includes a site visit of the full site extent, as well as where potential impacts may occur beyond the site boundaries such as cumulative impacts.
- Collate and analyse all available secondary data relevant to the affected project area.
- Cumulative effects: these must be considered in all impact reports.
- Specific attention must be given to the following:
  - Quantifying and assessing the existing scenic resources/ visual characteristics on, and around, the proposed site.
  - Evaluating and classifying the landscape in terms of sensitivity to a changing land use.
  - Determining viewsheds, view corridors and important viewpoints in order to assess the visual impacts of the proposed project.
  - Determining visual issues, including those identified in the public participation process.
  - Reviewing the legal framework that may have implications for visual/ scenic resources.
  - Assessing the significance of potential visual impacts resulting from the proposed project for the construction, operational and decommissioning phases of the project.
  - Identifying possible mitigation measures to reduce negative visual impacts for inclusion into the project design, including input into the Environmental Management Plan (EMP).

3.2 Summary of Visual Impact Assessment Methodology

The process that VRM Africa follows when undertaking a VIA is based on the United States Bureau of Land Management's (BLM) Visual Resource Management method. This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using a standard assessment criteria and involves the measurement of contrast in the form, line, texture and colour of the proposed landscape modification brought about by a project, against the same elements found in the existing natural landscape.*(BLM. USDI. 2004)*

The first step in the VIA process is determining the existing landscape context. A regional landscape survey is undertaken, which identifies defining landscape features that surround the site of a proposed development, and sets the scene for the VIA process to follow. These features, also referred to as visual issues, are assessed for their scenic quality/worth. A VIA also assesses to what degree people who make use of these locations (e.g. a nearby holiday resort) would be sensitive to change(s) in their views, brought about by a proposed project (e.g. a mine).*(Assessment undertaken up to this point falls within the ambit of the Field Study.)*

These people are referred to as receptors and are identified early on in the VIA process. Only those sensitive receptors who qualify as Key Observation Points (KOPs) by applying certain criteria, are used to measure the amount of contrast generated by changes caused by project activities, against the existing landscape (i.e. visual impact).

The landscape character of the proposed project site is then surveyed to identify areas of similar land use and landscape character. These areas are evaluated in terms of scenic quality (landscape significance) and receptor sensitivity to landscape change (of the site) in order to define the visual objective for the project site. The overall objective is to maintain a landscape's integrity, but this can be achieved at varying levels, called VRM Classes, depending on various factors, including the visual absorption capacity of a site (i.e., how much of the project would be "absorbed" or "disappear", into the landscape). The areas identified on site are categorised into these Classes by using a matrix developed by BLM Visual Resource Management, which is then represented in a visual sensitivity map.

Landscapes are sub-divided into three distance zones based on relative visibility from travel routes or observation points. Proximity to surrounding receptors is evaluated in terms of these distance buffers:

foreground zone is less than 7km, background zone is from 7 to 24km and "seldom seen" has no receptors. Viewshed maps are generated that indicate the overall area where the project activities would be visible, and in which distance buffer zone the receptors fall. *(Assessment undertaken up to this point falls within the ambit of the Baseline Study. What follows after this point comprises the Impact Assessment Study.)*

The proposed project activities are then finally assessed from the KOPs around the site to see whether the visual objectives (VRM Classes) defined for the site, are met in terms of measuring the potential change to the site's form, line, colour and texture visual elements, as a result of the proposed project (i.e. are the expected changes within acceptable parameters to ensure that the visual character of the landscape is kept intact and, if not, what can be done by the project to ensure that it is).Photo montages are generated to represent the expected change in the views, as seen from each KOP and, if class objectives are not met, to also show how proposed mitigation measures could improve the same views.

Using the impact assessment method provided by the environmental consultant, each project activity is then assessed for its visual impact. This is based on the contrast rating which was undertaken from each of the surrounding receptors to determine whether the proposed activities meet the recommended visual objectives defined, in order to protect the landscape character of the area. Recommendations are made and mitigations are provided.

Refer to Annexure 2 for a detailed description of the applied Visual Impact Assessment and Aurecon South Africa's Impact Assessment methodology.

In terms of Visual Impact Assessment best practice, the following guidelines were referred to:

- Internationally, the U.K. Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Landscape and Visual Impact Assessment'; (U.K Institute of Environmental Management and Assessment *(IEMA. 2002);*
- The 'Guideline for Involving Visual and Aesthetic Specialists in EIA Processes' generated by South Africa's Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning*(Oberholzer, B. 2005);* and
- The International Finance Corporation's (IFC) performance standards (PS) on environmental and social sustainability *(IFC. 2012).*

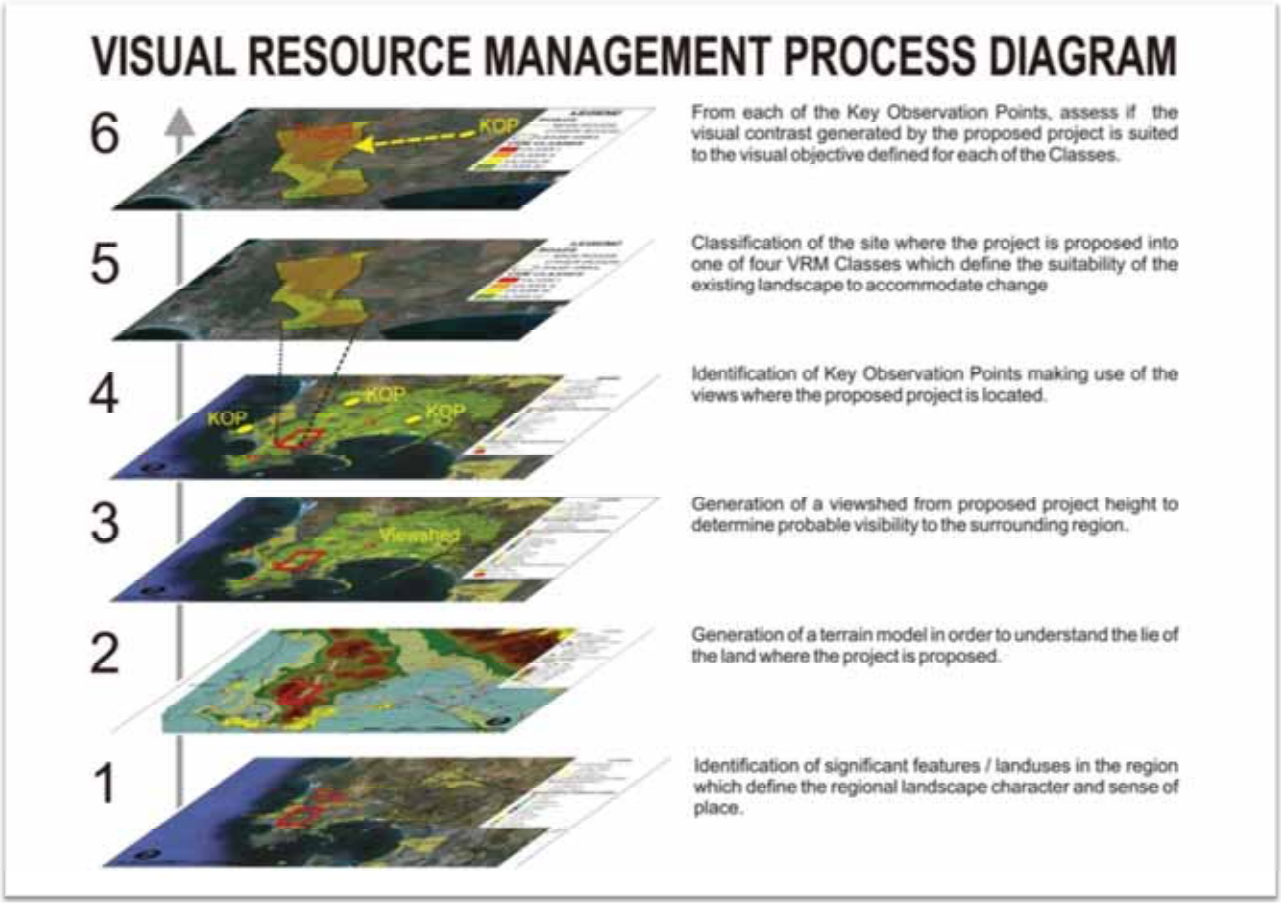


Figure 2: VRM Process Diagram

4 LIMITATIONS AND ASSUMPTIONS

- Although every effort to maintain accuracy was undertaken, as a result of the Digital Elevation Model (DEM) being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence.
- Some of the mapping in this document was created using Bing Maps (previously *Live Search Maps*, *Windows Live Maps*, *Windows Live Local*, and *MSN Virtual Earth*) and powered by the Bing Maps for Enterprise framework.
- The use of Google Earth Pro for mapping is licensed for use in this document.
- The information for the terrain used in the 3D computer model on which the visibility analysis is based on is:
    - The ASTGTM_S2 3E014 and ASTGTM_S24E014 data set. ASTER GDEM is a product of METI and NASA (ASTER, Source: https://lpdaac.usgs.gov), and
    - South African Provincial Survey General data.
- In the absence of specific provincial regulations for Visual Impact Assessment, reference has been made to the Western Cape Department of Environmental Affairs and Development Planning's "*Guideline for involving visual and aesthetic specialists in EIA processes"*.
- In order to effectively assess the cumulative impacts other proposed wind and solar energy projects in the area need to be isolated.
- Determining visual resources is a subjective process where absolute terms are not achievable. Evaluating a landscape's visual quality is complex, as assessment of the visual landscape applies mainly qualitative standards. Therefore, subjectivity cannot be excluded in the assessment procedure *(Lange 1994)*. The project deliverables, including electronic copies of reports, maps, data, shape files and photographs, are based on the author's professional knowledge, as well as available information. The study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of assessment undertaken. VRM Africa reserves the right to modify aspects of the project deliverables if and when, new/ additional information may become available from research or further work in the applicable field of practice, or pertaining to this study.

'Principles that influences (development) within a receiving environment include the following:

- The need to maintain the overall integrity (or intactness) of the particular landscape or townscape;
- The need to preserve the special character or 'sense of place' of a particular area; and
- The need to minimize visual intrusion or obstruction of views within a particular area.'
  (Oberholzer, B., 2005).

5 LEGISLATIVE CONTEXT

5.1 Applicable Laws and policies

In order to comply with the Visual Resource Management requirements, it is necessary to clarify which planning policies govern the property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the following planning policies:

- Western Cape DEA&DP Guideline for involving visual and aesthetic specialists in EIA processes (Oberholzer, B. 2005.) (no specific Eastern Cape Guidelines available)
- Inxuba Yethemba Municipality Final Integrated Development Plan (IDP). 2010.

Inxuba Yethemba Municipality IDP

- The N10 National Road which is the vital economic link between Port Elizabeth and the North runs through Cradock and skirts Middelburg. The economy of the area is largely based on agriculture and tourism. The supply of tourism products and services in IYM are nature-based and heritage tourism products
- As is the case with water infrastructure the electrical infrastructure requires serious and urgent attention as the municipality is currently unable to meet the increasing current demands. Cradock unit is currently experiencing serious power supply shortcomings due to limited capacity levels.

Western Cape DEA&DP Guideline for involving visual and aesthetic specialists in EIA processes

The DEA&DP Guideline for involving visual and aesthetic specialists in EIA processes states that the BPEO should address the following:

- Ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The BPEO must also ensure that development must be located to prevent structures from being a visual intrusion (i.e. to retain open views and vistas).
- 'Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion in scenic areas;
- Retention of wilderness or special areas intact as far as possible;
- Responsiveness to the area's uniqueness, or sense of place.'

5.2 Relevant Standards to Comply With

The International Finance Corporation (IFC) prescribes eight performance standards (PS) on environmental and social sustainability. The first is to identify and evaluate the environmental and social risks and impacts of a project, as well as to avoid, minimise or compensate for any such impacts. Under Performance Standard 6, ecosystem services are organized into four categories, with visual/ aesthetic benefits falling into the category of cultural services, which are the non-material benefits people obtain from ecosystems. This emotional enrichment that people experience and obtain from cultural ecosystems services is described by The Millennium Ecosystem Assessment, 2005, Ecosystems and Human Well-being: Synthesis report as follows: "Cultural ecosystems services: the non-material benefits that people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences."

The above includes the following, amongst others:

- Inspiration: Ecosystems provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising;
- Aesthetic values: Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, scenic drives, and the selection of housing locations;

- Sense of place: Many people value the “sense of place” that is associated with recognized features of their environment, including aspects of the ecosystem;
- Cultural heritage values: Many societies place high value on the maintenance of either historically important landscapes (“cultural landscapes”) or culturally significant species; and
- Recreation and ecotourism: People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.

The visual experience is not limited to the visual senses, but is a multisensory emotional involvement experienced by people when they perceive a specific scene, landmark, landscape, etc. The assessment subject of Visual Impact assessment (VIA) is in itself a result of human perception.

6 PROJECT DESCRIPTION

The objective of this section is to describe the character of the project activities and define the extent to which it will be visible to the surrounding areas. The Draft Scoping Report indicated that the Project Site extent included three additional land parcels. The 'current PV footprint' is considered a feasible option for a development of this nature. The three additional land parcels are no longer required for the project and will not be assessed in this document.

The need and desirability of the proposed activity is based on the well-documented reasons for the desirability of renewable energy such as solar energy, which 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.

It is anticipated that the project will feed a total of 90MW into the national grid. The project comprises the following activities:

- PV solar panels/modules (arranged in arrays), 3.33m in height;
- PV module mountings;
- DC-AC current inverters and transformers;
- New 'loop-in loop-out' substation facilitating connection to the national electricity grid (4000 $m^{2)}$;
- 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 including perimeter fencing, offices, construction laydown area and temporary construction camp

PV Arrays and Mountings

The proposed development will include PV panels that will occupy approximately 110 ha (1.1 k) 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. 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). The PV panels will be mounted on aluminum fixed frame structures approximately 3.33 m in height from the ground with a spacing of 6.2 m between rows. The PV arrays will face north in order to capture maximum sunlight. *(ERM. 2013)*

Grid Connection

The 132 kV power supply from the new 'loop-in loop-out' substation will be connected to the existing 132kV Transmission Line, which feeds the Eskom Drennan Traction Substation, located to the north of the site on the east side of the railway line. This connection shall be achieved by breaking the existing 132 kV line and then connecting two overhead power lines of approximately 250 m in length to the new 'loop-in loop-out' substation of the PV power facility. Both power lines will be installed on the same steel lattice structure, according to Eskom specifications. *(ERM. 2013)*

Access Roads and Internal Paths

The site will be accessed from the R310 gravel road running along the eastern perimeter of the site. The R310 road links to the N10 national road to the north east 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. Internal paths will be created to enable access within the PV power facility. *(ERM. 2013)*

Construction

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. 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. *(ERM. 2013)*

Layout Alternatives

The PV power facility layout and project component design was subjected to a number of iterations, based on technical aspects of the project. These included aspects such as detailed Site-specific solar data, construction conditions, as well as specialist input and sensitivity ratings for the Site that were explored during the EIA process. As such the final PV Footprint (See Figure 7) was selected as the most feasible Site layout alternative. Technical criteria and buffer zones considered in deriving the final PV footprint included:

- Where possible, avoiding areas which are very rocky or uneven, in order to minimise earthworks and thus real and potential environmental impact;
- Buffer around drainage lines of 50 m;
- Buffer around heritage sites of 10m;
- National road buffer of 150m;
- Local district road buffer of 100 m;
- Railway buffer of 100 m;
- External farm boundary buffer of 50 m; and
- Buffer along existing Eskom grid infrastructure of 50 m.

The suitability of different types of PV solar panels was assessed. 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.

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. *(ERM. 2013)*

Figure 3: Photograph of proposed aluminium frames *(EMP. 2013)*

Figure 4: Photograph of proposed PV panels *(EMP 2013)*

Figure 5: Photograph of proposed power transformer *(EMP.2013)*

Figure 6: Project Locality Map

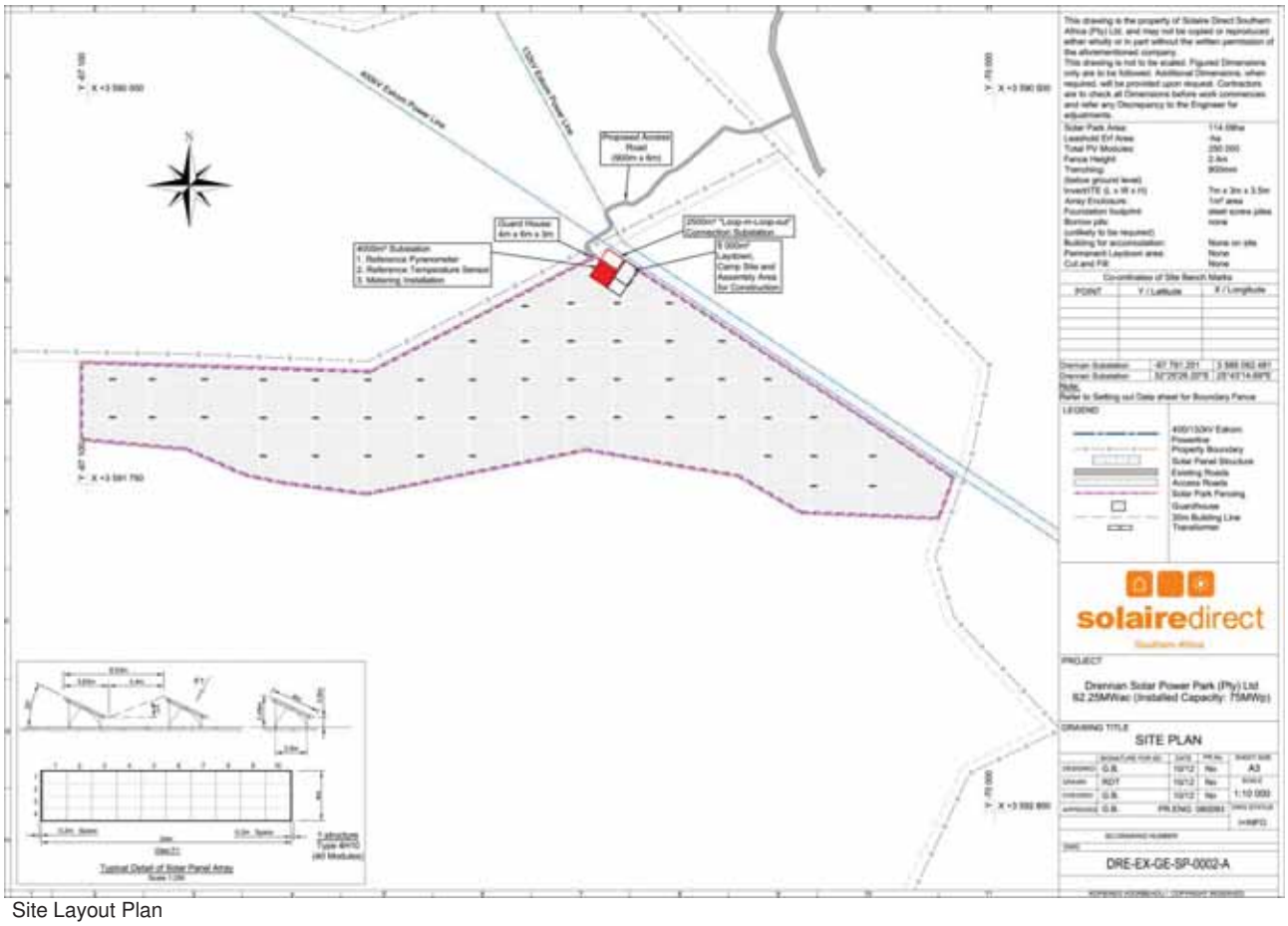


Figure 7: Site Layout Plan

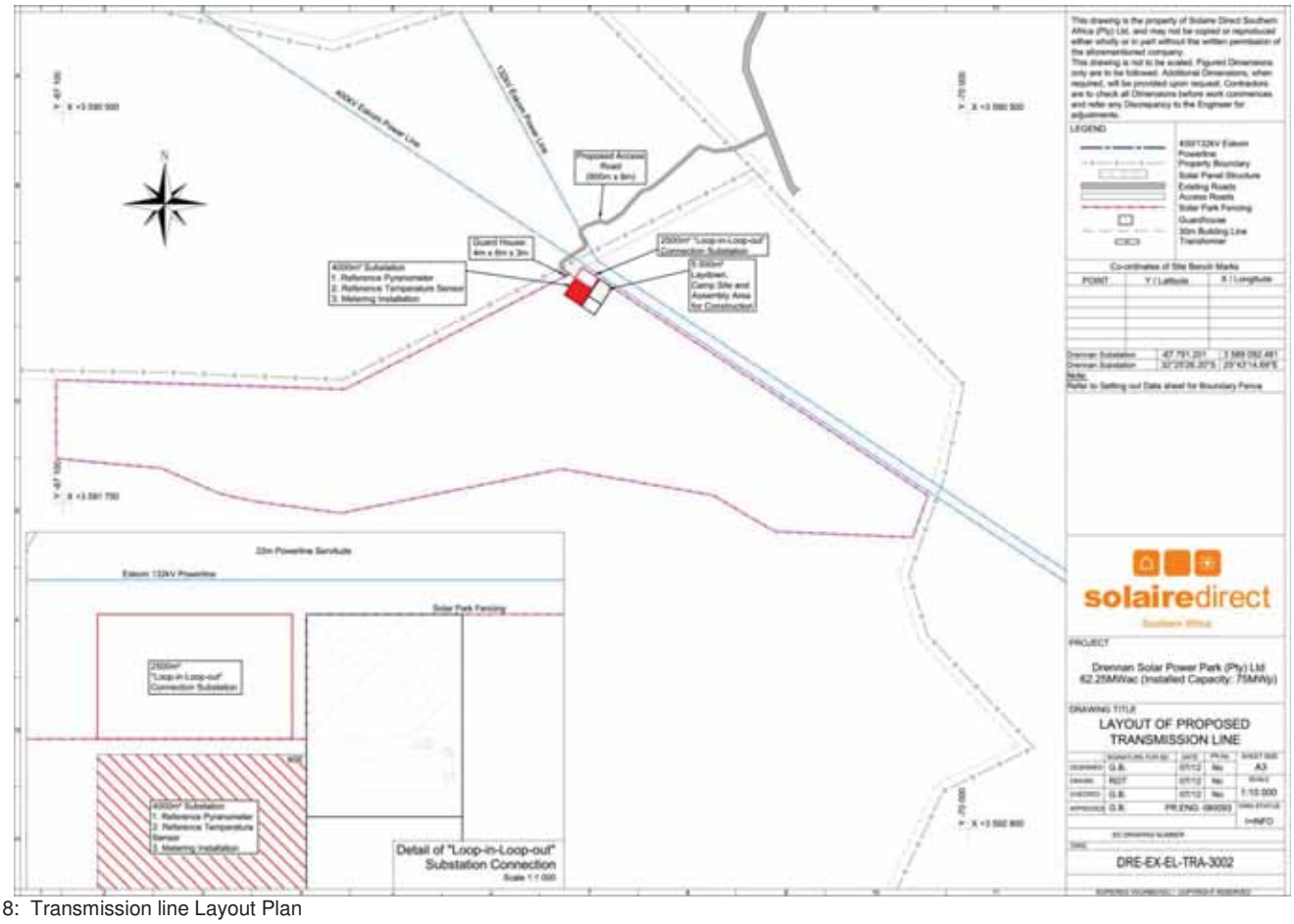


Figure 8: Transmission line Layout Plan

7 NATURE OF THE RECEIVING ENVIRONMENT

Landscape character is defined by the U.K. Institute of Environmental Management and Assessment (IEMA) as the 'distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, land form, soils, vegetation, land use and human settlement.' It creates the specific sense of place or essential character and 'spirit of the place' *(Spon Press, 2002).* The first step in the VIA process is determining the existing landscape context of the region and of the site(s) where the project is proposed.

The proposed site is located 26 km south of Cradock, in the upper valley of the Great Fish River. This is approximately 300 km north-east of Port Elizabeth in the Eastern Cape. As depicted in the locality map in Figure 6, the proposed project site is 2 km from the N10 highway, the main access route between Cradock and the coastal areas. The area is dominated by a series of parallel mountain ranges, running east to west, that have a profound effect on the natural vegetation and the subsequent biome diversity of the area. The Winterberg Mountain range and the fertile Fish River Valley dominate the area.

Cradock is on the eastern edge of the Karoo, near the headwaters of the Great Fish River (Nxuba River), and it is a dry and barren area, dominated by flat-topped hills and wind-swept plains. Cradock is one of the Cape's main centres of the wool industry, and also produces beef, dairy, fruit, lucerne and mohair. In the neighbouring Mountain Zebra National Park, a few herds of the now-protected mountain zebra survive.

7.1 Local Landscape Context

The site is designated for agricultural use, with current agricultural practices including grazing for livestock (cattle, sheep). Limited cultivation is undertaken within the Project Site with a single crop circle typical of pivot agriculture located around 2km to the north of the PV Footprint. 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, directly to the south of the PV footprint. There are six small dams that are located at points along the drainage lines within the Project area, the nearest of which is located 35m to the south of the PV footprint.

There is an existing railway line running adjacent the eastern border of the site in a north south direction. An existing gravel road network exists on the site, which initially crosses the railway line. The existing 132kV Drennan Traction Substation is located to the north of the site, and an existing 132 kV power line traverses the northeastern section of the site in a northwest/southeast direction, and links up with the Drennan Traction Substation.

As indicated in Figure 9 on the following page, the significant surrounding landscape features identified during the field survey are listed and mapped below.

- Western mountains
- Eastern mountains
- Valley landscape with associated river and scattered wetlands
- Agriculture
- Farmsteads and outbuildings
- M10 as a tourism corridor
- Infrastructure, including railway line, Drennan substation and associated power lines

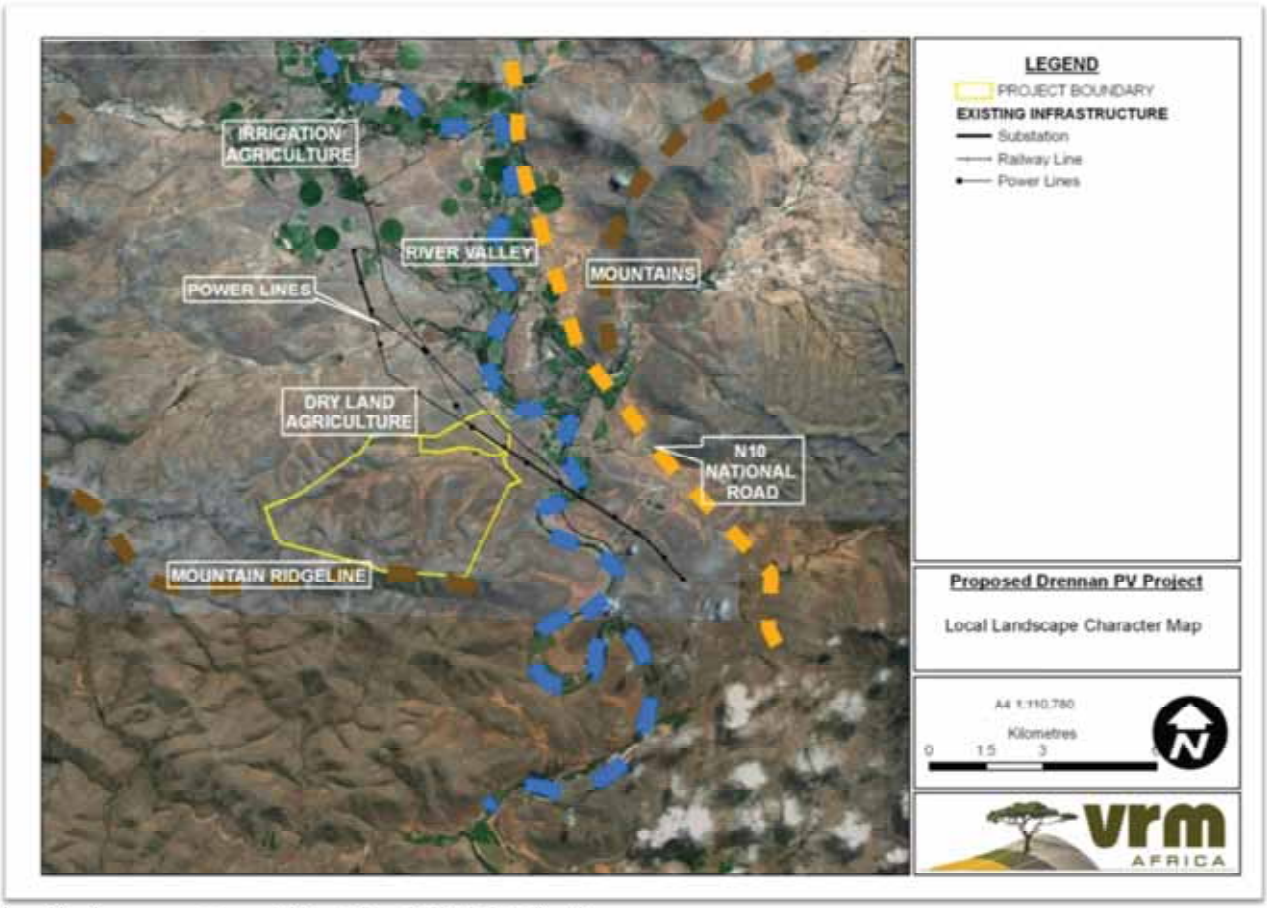


Figure 9: Local landscape context overlaid onto Google Earth Satellite Map

7.1.1 *Western Mountains*

Figure 10: View of western mountains

The land form of the western mountains is dominant in the landscape and interesting within the setting, but is not exceptionally striking, and is fairly common within the region. The mountain vegetation is limited to only a few major types, and colours are generally subtle and in muted tones.

The western mountain range is not a landscape feature that is extensively utilized. Due to the scale of the feature, public interest would be moderate. However, adjacent landowners may regard it as an important landscape feature to preserve, even though it may not be important enough to maintain a *high* level of visual quality.

These mountain areas are steep slope areas that would require some degree of development constraint, in terms of the Western Cape DEA&DP Guideline for the Management of Development on Mountains, Hills and Ridges of the Western Cape. They would have higher biodiversity due to their remoteness, and are a draw card for existing and future eco-tourism activities in this area. In order to protect the visual resources of this mountain landscape, it is recommended that low levels of visual contrast are generated by the project, as seen from the receptors making use of tourist activities in the areas surrounding these mountains.

7.1.2 *Eastern Mountains*

Figure 11: View of eastern mountains

As for the Western Mountains, the land form of the eastern mountains is dominant in the landscape and interesting within the setting, but is not exceptionally striking, and is fairly common within the region. The vegetation on these mountains only includes a few major types and colours are generally subtle and in muted tones.

With regard to general receptors in the area, the eastern mountains are also not a landscape feature that is extensively used. Due to the scale of the feature, public interest would be moderate. However, adjacent landowners may regard it as an important landscape feature to preserve, even though it may not be important enough to maintain a *high* level of visual quality.

These mountain areas are steep slope areas which would require some degree of development constraint in terms of the Western Cape DEA&DP Guideline for the Management of Development on Mountains, Hills and Ridges of the Western Cape. They would have higher biodiversity due to their remoteness and are also a central theme for existing and future eco-tourism activities in this area. In order to protect the visual resources of this mountain landscape, it is recommended that low levels of visual contrast are generated by the project, as seen from the receptors making use of tourist activities in the area.

7.1.3 *Valley Landscape with River and Scattered Wetlands*

Figure 12: View of valley landscape with river and scattered wetlands

This landscape is characterised by flat valley depressions, with flowing water captured in moderately deep eroded river banks. The water, however, is not visible unless one is very near to it due to its recessed setting within the base of the valley. Vegetation becomes interesting along the river banks, but for the most part, there is little variety. Some intensity and variety in colour does occur, although it does not become a significantly dominant scenic element. The valley landscape feature, which is somewhat enhanced by the adjacent mountain scenery, is distinctive within its setting, though similar to others within the region. The R390 road runs mostly parallel to the river, and other minor roads cross the river. These manmade landscape modifications are discordant elements introduced into the valley landscape feature.

Landscape modification in close proximity to the river needs to be constrained to ensure that the sense of place of the greater area is not degraded.

7.1.4 *Agriculture*

Figure 13: View of agricultural activities

The landscape form related to agricultural activities is very flat, with little topographically interesting features. Even though agricultural activities are associated with seasonally rich colours, vegetation is usually a mono species. Water may be present but would not necessarily be noticeable. The adjacent scenery would moderately enhance this landscape feature and, although the agricultural landscape feature may be interesting in its setting, it is fairly common within the region. Agricultural activities in the study area include crop production, grazing and ostrich farming. Cultural modifications include irrigation systems as a minor discordant element.

This landscape feature is associated with high levels of use, where the user, and public interest, would express moderate concern for its value. This would be perceived as an important landscape feature to retain for its scenic quality.

Higher levels of visual contrast are generated by the farming activities located in the area, especially in the valley where centre pivot irrigation is prevalent. The agricultural setting is an important feature in the landscape and it is recommended that moderate levels of visual contrast are generated by the project, as seen from the surrounding agricultural receptors. For most receptors, the project site would appear mostly in the middle ground, but also in the background, of receptors' views.

7.1.5 *Farmsteads and Associated Outbuildings*

Figure 7: View of farmsteads and associated outbuildings

Vegetation associated with farmsteads is rich in colour, with different colour combinations, forms, patterns and texture. Farmsteads are interesting landscape features but common on a regional scale. Adjacent scenery would moderately enhance the overall scenic quality. As a landscape feature, farmsteads are perceived as a discordant element.

The amount of use of this landscape feature would be *high.* However, maintenance of the visual quality may not be a major concern for the users. Public interest would be low and the maintenance of visual quality to sustain adjacent land use objectives and special area management objectives would not be very important.

Higher levels of visual contrast are generated from the farming activities located in the area, especially in the valley where centre pivot irrigation is prevalent. The agricultural setting is an important feature in the landscape and it is recommended that moderate levels of visual contrast are generated by the project, as seen from the surrounding agricultural receptors. In most instances, it would appear at a range of distances to viewers.

7.1.6 *N10 as Tourist Corridor*

Figure 8: View of N10 as tourist corridor

Vegetation along the N10 road has some variety, but variation in colour does not create a dominant scenic element. The adjacent scenery enhances the visual quality of the N10 tourist corridor. However, this landscape feature is common within the region and introduces a discordant element that promotes disharmony.

The N10 is not only a major tourist route, but also a major transportation link. There would thus be a conflict between a *high* and *low* concern of public interest in the visual quality by the different types of users. Due to this, maintenance of visual quality to sustain adjacent land use objectives and special area management objectives would be *moderate* to *high*.

It is recommended that moderate to low levels of visual contrast are generated, as seen from N10 receptors, in order to protect the view corridor status of the route. It would also appear at a range of distances to viewers.

7.1.7 *Infrastructure*

Figure 9: View of infrastructure including railway line, Drennan substation and associated power lines

Infrastructural elements are perceived as discordant elements within a scenic landscape. The adjacent scenery would definitely enhance the visual quality, even though there is little variation in vegetation and colour. This landscape element is also common within the region.

The concern for visual quality by this type of user, and public interest, would be *low*. The amount of use would be *moderate*. Maintenance of visual quality to sustain adjacent land use objectives and special area management objectives would be *moderate* to *high*.

Within close context to these features, the level of change to the landscape can be moderate to high as the context is highly modified, generating higher levels of visual contrast. The project would also appear at a range of distances to viewers.

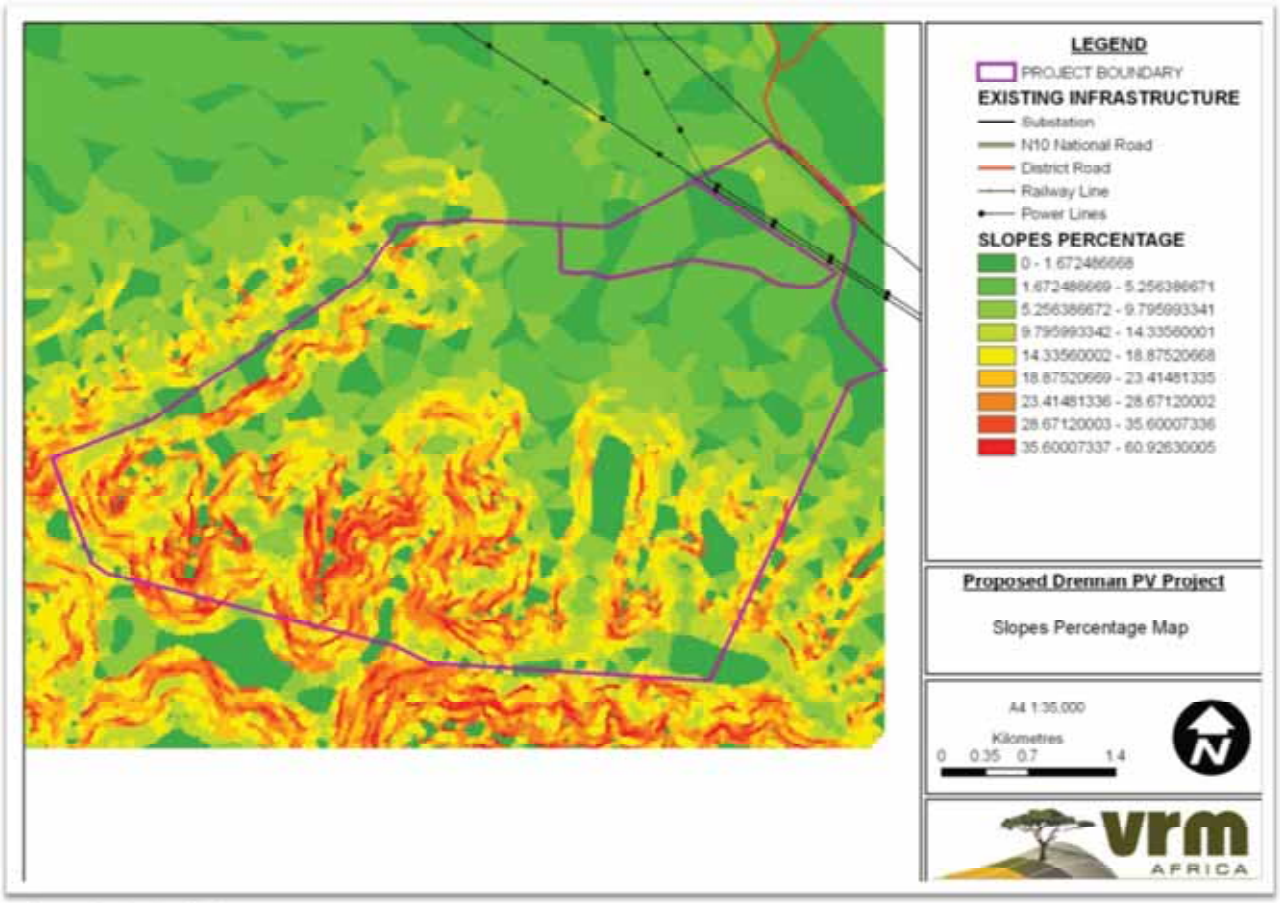


Figure 14: Slopes Analysis of site

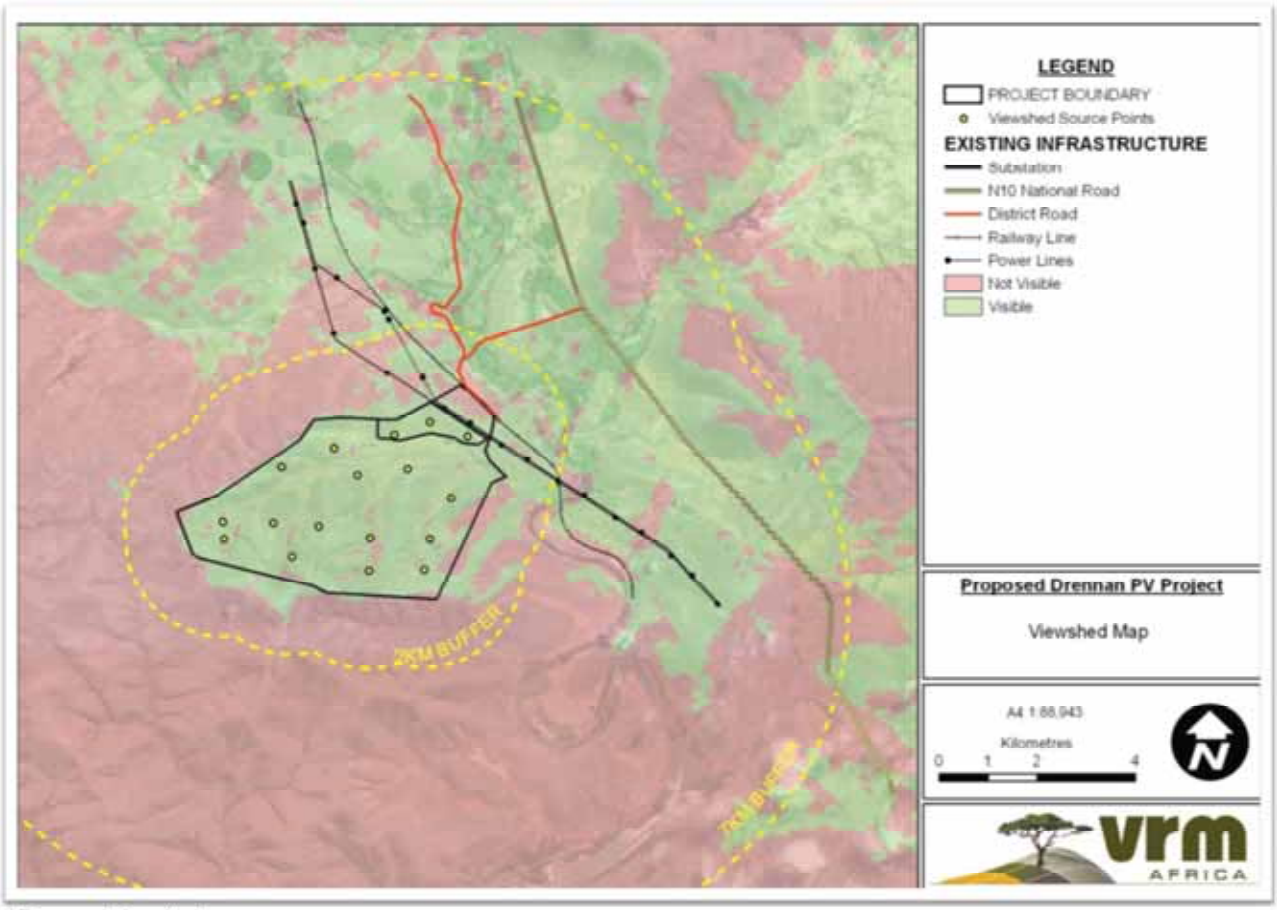


Figure 15: Proposed viewshed

8 PROJECT VISIBILITY

Making use of ASTGTM elevation data, a terrain model was generated for the area around the proposed project area from points located on the flatter agricultural lands more suited to the proposed PV project. The viewshed map, as seen in Figure 15, shows that the visibility would be local and contained to the valley area and that key receptors located on the N10 national road would be outside the two kilometre high exposure distance zone.

Photovoltaic panels and mountings	± 4.5m
Transmission lines	± 15 - 20m
Substations	± 15 - 20m
Boundary fence	± 2m

The geographic extent of the area would be local (limited to the immediate surroundings). Due to topographic undulation, the viewshed is constrained to the valley area and mainly within the six kilometre foreground/middle ground area, but would also extend further to the east on the raised ground areas of the eastern mountains. The undulating terrain further afield would reduce the clarity of the views, as seen from the mobile receptors. Due to the undulating terrain surrounding the site, as well as the predominantly south facing aspect of the majority of the site which is topographically screened from most of the more northern receptors, the visibility of the project is defined as *moderate to low.*

The following community points would be exposed to the proposed project and would need to be assessed to ascertain if, and where, they fulfill Key Observation Point criteria:

- The N10 road;
- The R390 road; and
- The Drennan farming communities to the north and east of the site, mainly making use of the Witmos – Mortimer road.

Key Observation Points (KOPs) are defined by the Bureau of Land Management as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology, which requires that the DoC that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations, or receptors, surrounding the property. The DoC generated by the proposed landscape modifications is measured against the existing landscape context in terms of the elements of form, line, colour and texture. Each alternative activity is then assessed in terms of whether it meets the objectives of the established class category, and whether mitigation is possible.*(USA Bureau of Land Management, 2004)*.

To define the KOPs, potential receptor locations were identified in the viewshed analysis, and screened, based on the following criteria:

- Angle of observation
- Number of viewers
- Length of time the project is in view
- Relative project size
- Season of use
- Critical viewpoints, e.g. views from communities, road crossings
- Distance from property

Making use of the above criteria, the following receptor locations were identified, as indicated in the map below:

- R1: N10 National highway

Due to the close proximity of these receptors, which are also located mainly to the north, only the N10 was utilised as a Key Observation Point as the contrast descriptions for the other location would be very similar if not exactly the same.

9 SITE LANDSCAPE CHARACTER

The site is located 26km south of Cradock, in the upper valley of the Great Fish River. It is situated approximately 2 km off the N10 with the Sneeuberg to the south west and the Great Winterberg Amatolas to the south east.

In terms of the VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change, and distance of the proposed landscape modification from key receptor points. The scenic quality is determined using seven key factors:

- **Land Form:** Topography becomes more interesting as it gets steeper, or more massive, or more severely or universally sculptured.
- **Vegetation:** Primary consideration given to the variety of patterns, forms, and textures created by plant life.
- **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
- **Colour:** The overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) are considered as they appear during seasons or periods of high use.
- **Scarcity:** This factor provides an opportunity to give added importance to one, or all, of the scenic features that appear to be relatively unique or rare within one physiographic region.
- **Adjacent Land Use:** Degree to which scenery and distance enhance, or start to influence, the overall impression of the scenery within the rating unit.
- **Cultural Modifications:** Cultural modifications should be considered, and may detract from the scenery or complement or improve the scenic quality of a unit.

Sensitivity levels are a measure of public concern for scenic quality. Receptor sensitivity to landscape change is determined using the following factors:

- **Type of Users:** Visual sensitivity will vary with the type of users, e.g. recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- **Amount of Use:** Areas used by large numbers of people are potentially more sensitive.
- **Public Interest:** The visual quality of an area may be of concern to local, or regional, groups. Indicators of this concern are usually expressed via public controversy created in response to proposed activities.
- **Adjacent Land Uses:** The interrelationship with land uses in adjacent lands. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be as visually sensitive.
- **Special Areas:** Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Critical Biodiversity Areas frequently require special consideration for the protection of their visual values.
- **Other Factors:** Consider any other information such as research or studies that include indicators of visual sensitivity.

The table below is utilised to define the VRM Classes that represent the relative value of the visual resources of an area:

i. **Classes I and II** are the most valued
ii. **Class III** represents a moderate value
iii. **Class IV** is of least value

This is undertaken making use of the matrix below, developed by BLM Visual Resource Management method as seen below, which is then represented in a visual sensitivity map.

		VISUAL SENSITIVITY LEVELS								
		High			Medium			Low		
SCENIC QUALITY	A (High)	II	II	II	II	II	II	II	II	II
	B (Medium)	II	III	III/ IV *	III	IV	IV	IV	IV	IV
	C (Low)	III	IV	IV	IV	IV	IV	IV	IV	IV
DISTANCE ZONES		fore/middle ground	Background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

(A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11)
* If adjacent areas are **Class III** or lower, assign **Class III**.
If higher, assign **Class IV**.

As indicated in Figure 14 slopes percentage map and Figure 16 cross-section map on the following page, the project site is undulating and rises to the south and west where steep slopes are found. On the north-south axis, the elevation ranges from 804 m in the north, to 1233 m in the south. On the west to east axis, the elevation ranges from 1205 m in the west, to 850 m in the east. The area is a valley which slopes towards the Fish River in the east.

The site was surveyed for scenic quality and receptor sensitivity to landscape change at five points located on the property and the following landscapes were defined and described:

- Drainage lines and Gullies
- Mountain, Hills and Steep Slopes
- Infrastructure: Powerlines

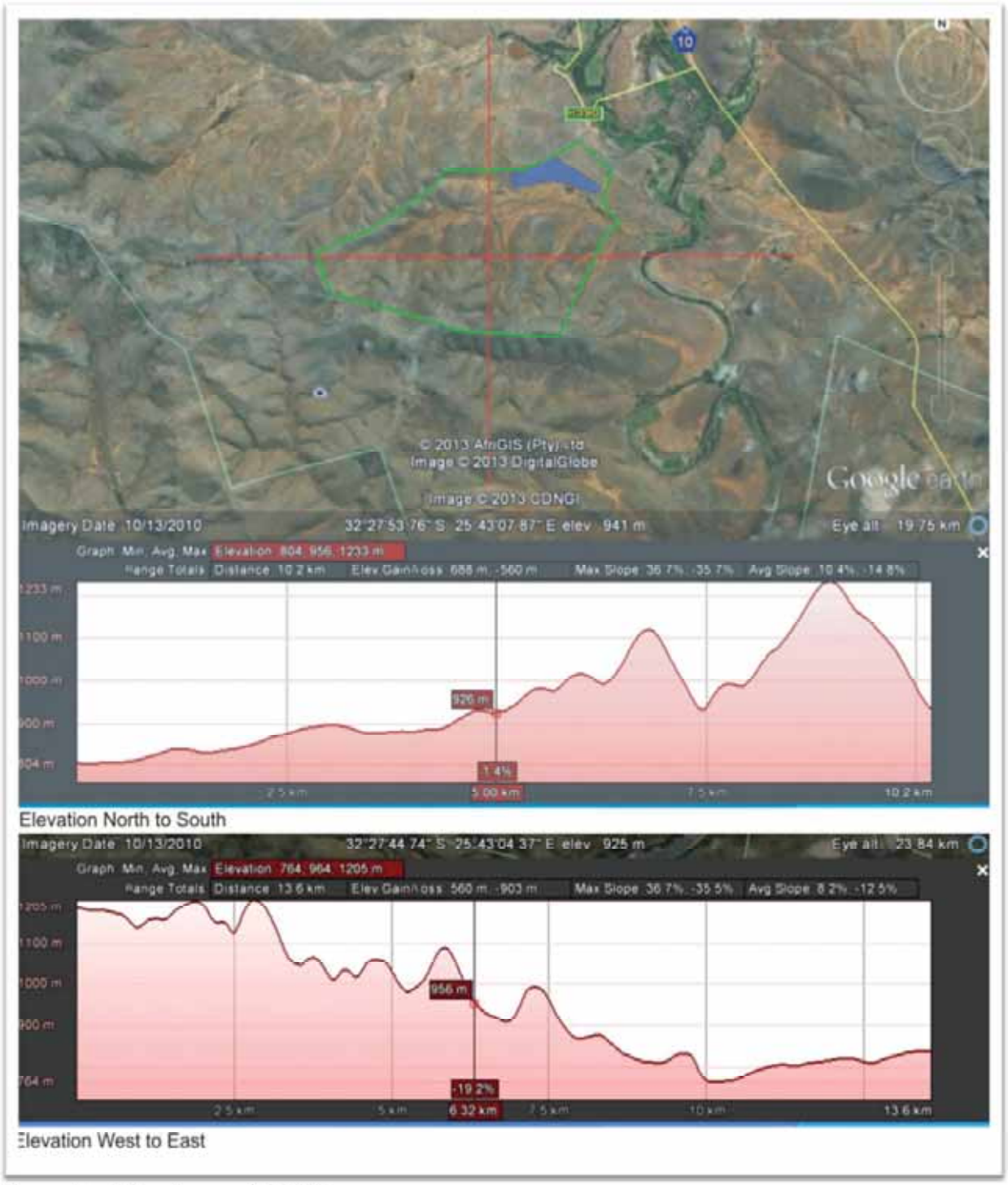


Figure 16: Elevation model of site

Figure 17: Site Landscape Character Survey Point Map (North up)

9.1.1 *Mountains, Hills and Steep Slopes: S2 and S4*

Photograph taken south from Survey Point S2

Photograph taken south from Survey Point S4

The land form of the surrounding low hills and steep slopes is dominant in the landscape and interesting within the setting, but is not exceptionally striking, and is fairly common within the region. The mountain vegetation is limited to only a few major types, and colours are generally subtle and in muted tones.

These areas are steep slope areas which, in terms of the Western Cape DEA&DP Guideline for the Management of Development on Mountains, Hills and Ridges of the Western Cape, would require some degree of development constraint. They would have higher biodiversity due to their remoteness, and would be a draw card for existing and future eco-tourism activities in this area. In order to protect the visual resources of this mountain landscape it is recommended that a Class II visual objective be met, and that landscape modification, as seen from the receptors in this area, are subjected to low levels of visual intrusion.

9.1.2 *Drainage Lines and Gullies: S1 and S3*

Photograph taken east from Survey Point S1

Photograph taken east from Survey Point S3

The survey point S3 relates to an area to the south of the property which is a shallow valley which results in moderate VAC levels as areas to the north, west and south are screened by the surrounding elevated topography. The landform is a flat valley bottom with few interesting features. Vegetation is veld grasses interspersed with small acacia trees which offer some variety but is limited to only one or two major types. The site does include a number of dry river washes which create an interesting feature but absent or present but not noticeable. Adjacent scenery of the low hills to the south and east and the shallow valley to the south moderately enhances the overall visual quality. The landscape is not scarce and although interesting within its setting, is fairly common within the region. Man made modifications include two small dams as well as much erosion as indicated in the photograph taken from survey point S1, which do degrade the landscape. The overall scenic quality of the site was defined as moderate and assigned a VRM Scenic Quality Rating of C.

In terms of receptor sensitivity to landscape change at the locations, the overall rating was defined as Moderate due to the close proximity to the surrounding hills as well as the close proximity to the river washes. The amount of use is low and the type of users mainly related to the local agricultural activities.

With moderate scenic quality and receptor sensitivity to landscape change but with receptors located within the foreground distance zone, a VRM Class III was assigned to the site. However, due to the drainage lines located in the area which are prone to erosion and subsequent visual decay, a Class II was assigned in order to ensure that limited landscape modification took place.

9.1.3 *Railway Infrastructure and Power Lines*

Photograph of Power Lines taken at Survey Point S5

Figure 18: Photograph of existing power lines, railway, associated station and cluster development

The landscape forms associated with these infrastructural elements are mostly flat, but do have some interesting characteristics where it cuts through the topography and where some variety in vegetation occurs, mostly associated with the station and cluster development where colour is evident. The adjacent scenery definitely enhances the visual quality, even though the setting is fairly common within the region. Public interest would be low and most users would have a low concern for these landscape features. Maintenance of visual quality would be high. A Class IV rating was assigned to these landscape features.

9.1.4 *Site Landscape Character Summary Table*

Survey Points					
ID	S1	S2	S3	S4	S5
Name	Rocky Outcrop Agricultural	Hill Nature/ wilderness	Gully/ wash area	Grass and Scrub Agricultural	Grass and Scrub Agricultural
VAC	Medium	Low	Medium	Medium	Medium
Viewshed	High	High	Low	Medium	Medium

Scenic Quality					
Land form	2	3	2	2	2
Vegetation	2	3	3	2	2
Water	1	1	2	1	1
Colour	2	2	3	2	2
Adjacent scenery	4	4	3	4	4
Scarcity	1	3	1	1	1
Cultural modifications	-2	0	0	0	0
Score	10	16	14	10	10
Category	C	B	B	C	C

(A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11)

Sensitivity					
Type of user	Low	Low	Low	Low	Low
Amount of use	Low	Medium	Low	Low	Low
Public interest	Low	Medium	Medium	Low	Low
Adjacent land users	Low	High	Medium	Low	Low
Special areas	Medium	Medium	Medium	Medium	Medium
Score	Low	Medium	Medium	Low	Low

(L – Low, M = Moderate, H = High)

Distance	BG	BG	BG	BG	BG

VRM Class	III	II	II	III	III

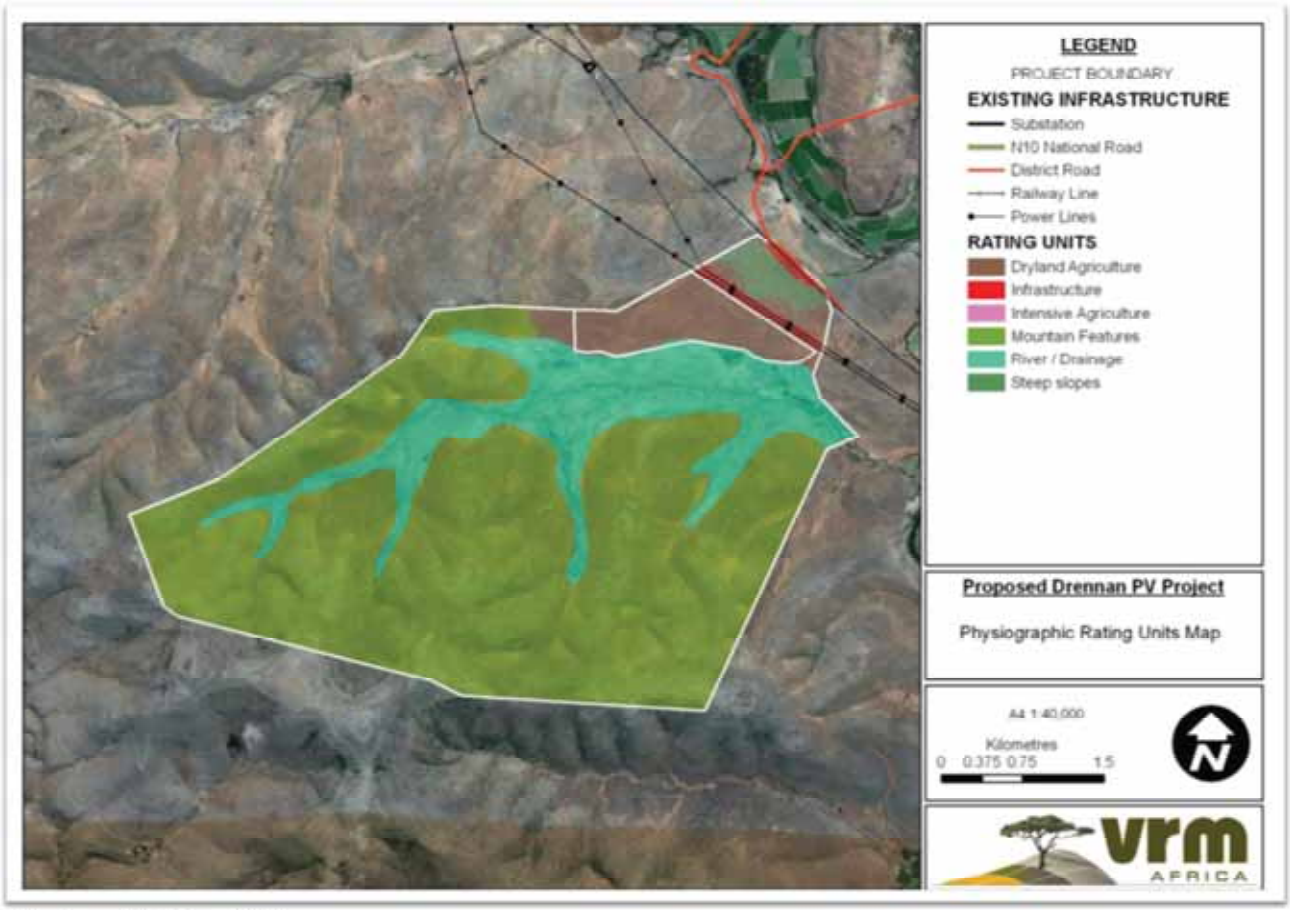


Figure 19: Physiographic Rating Unit Map

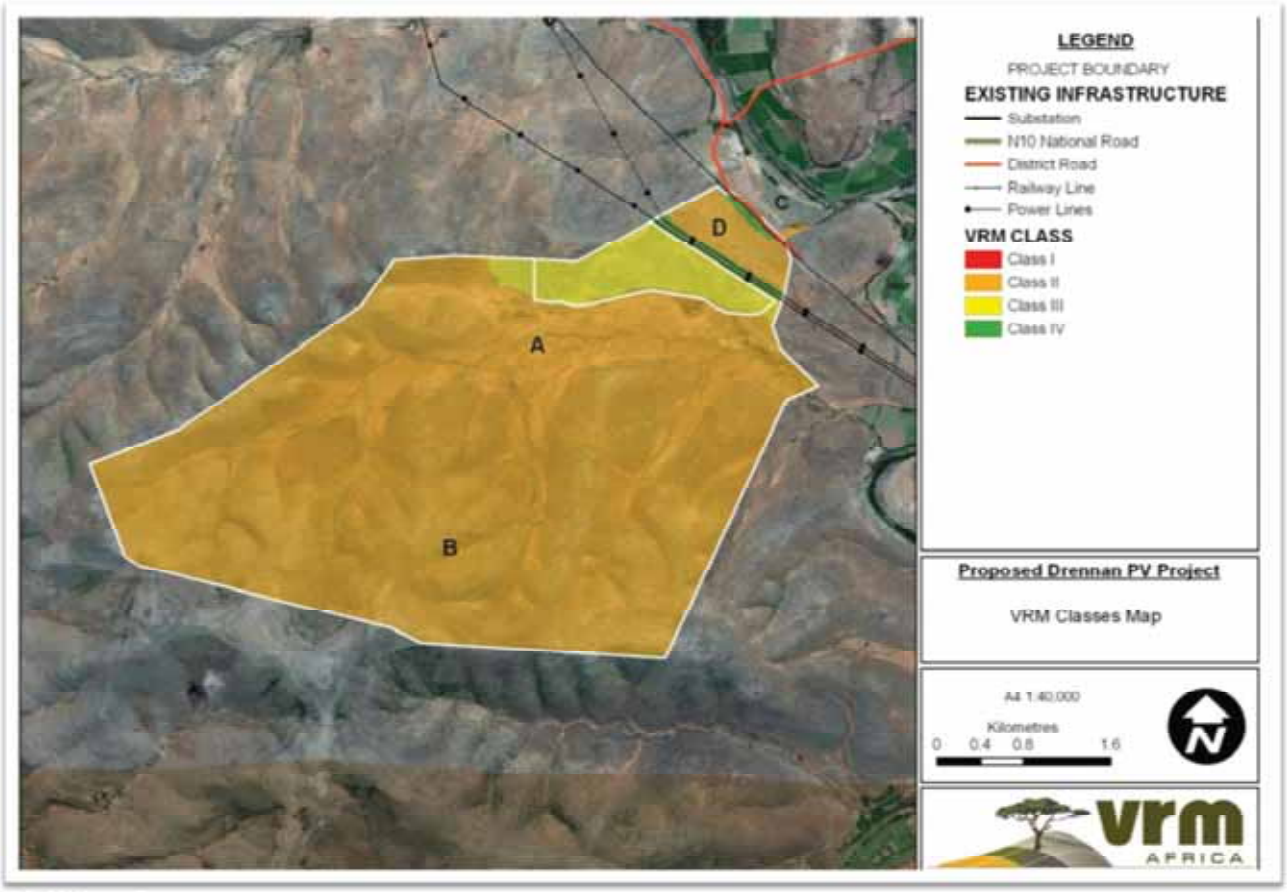


Figure 20: VRM Class Map

10.1.1 *VRM Classes and Objectives*

Evaluation of the suitability of a proposed landscape modification (brought about by elements or activities of a proposed project) is undertaken by means of assessing the proposed modification against a predefined management objective assigned to each class. The USA Bureau of Land Affairs has defined four Classes that represent the relative value of the visual resources of an area:

i. **Classes I and II** are the most valued; e.g. wilderness areas
ii. **Class III** represents a moderate value; and
iii. **Class IV** is of least value.

Based on the survey points and a landuse area map generated for the property depicted in Figure 17, a constraints map was generated for the site, which defined the preferred visual objective for proposed landscape modifications on the site. The following findings were made:

The VRM Classes were derived from the site scenic quality, the predicted receptors sensitivity to landscape modification of the site and the distance from the site to the key receptors. The ability of the site to absorb landscape change was defined as *moderate* due to the close proximity of the site to the Eskom Powerline which is routed to the north of the site. Other factors which increase the VAC levels are the adjacent substation, railway line infrastructure and the location of a large portion of the site on south facing slopes, the latter screens most of the site from the more northern based receptors. Factors which reduce the VAC include its existing agricultural landuse and the ridgeline which is located to the northern section of the site. Scenic quality of the site varies between *moderate* (B) and *low* (C). The value of the site scenic quality is increased by the southern hilly region and undulating landform. The proximity of the site to the power lines and the soil erosion of much of the steeper areas of the site are the factors which detract from the scenic quality. Due to the remoteness of the site and its proximity to the substation and transmissions lines, receptor sensitivities are reduced. The visibility of the site from the N10 is a factor which increases the visual sensitivity of the receptors as the route is associated with tourist traffic.

The following recommendations were made:

Class I

- No areas were identified as Class I areas as the zoning is agriculture.

Class II

- **Ref A**: It is recommended that the **river areas and washes** are excluded from the development area, as they are important biodiversity areas and an important component of the landscape context. They define the shapes of the fields as seen by the N10 receptors.
- **Ref B**: Class II was assigned to the **low hills, mountains and ridges** due to steeper slopes, greater visual prominance and visual continuity with the surrounding mountains. The scenic quality is *high* and defined as requiring Class II visual objectives to maintain the existing landscape character. This visual objective allows for low levels of landscape modifications in order to retain the existing character of the landscape.
- **Ref C**: The areas in close proximity to the Fish River are used for intensive agriculture and are defined as Class II to protect the Fish River landscape character.
- **Ref D**: Steep slopes areas are also identified as Class II as landscape modifications in these areas will generate higher levels of visual contrast and intrusion.
- All these areas would require low levels of change if the current landscape character is to remain.

Class III

- A Class III visual objective was assigned to the **agricultural fields on the site, farmsteads and the R390**, as this type of landscape is fairly common in the area and receptor sensitivity would be low. However, the rural agricultural sense of place is also important as an element in the greater landscape and would need some mitigation. The visual objective of this Class is to partially retain the existing character of the landscape.

Class IV

- The **power lines**, **substation and railway line sections** of the site offer existing higher levels of visual contrast to proximate receptors, and do detract from the scenic quality. It is recommended that higher visual contrast-generating landscape modifications be located in closer proximity to these areas.

11 CONTRAST RATING FROM KEY OBSERVATION POINTS

The contrast rating, or impacts assessment phase, is undertaken after the inventory process has been completed. The suitability of landscape modification is assessed by measuring the Degree of Contrast (DoC) of the proposed landscape modification to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape in terms of the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None** :The element contrast is not visible or perceived.
- **Weak** :The element contrast can be seen but does not attract attention.
- **Moderate** :The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong** :The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is to provide for management activities which require major modifications of the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

Table 1: Contrast Rating Table: N10

Visual Objective: Class III			
Landscape Modifications	**Construction**	**Operation**	**Closure**
Line	Weak	Weak	None
Colour	Weak	Moderate	None
Texture	Moderate	Moderate	None
Form	Weak	Weak	None
Predicted contrast	Moderate	Moderate	None
Visual Obj. Met?	Y(M)	Y(M)	Y(M)

Key: Y = Yes, N = No, Y (M) = Yes with mitigation, x = Not visible

The view from the N10 can be seen in Figure 22. The construction phase would create a *moderate* degree of contrast and would meet the visual objectives of the site with mitigation. The operation phase would generate *moderate* contrast to the existing predominantly rural agricultural landscape and would meet the visual objective, with mitigation. Should all the structures be removed, within a short period of time, the visual status quo could be regained and the Class III visual objectives could be met.

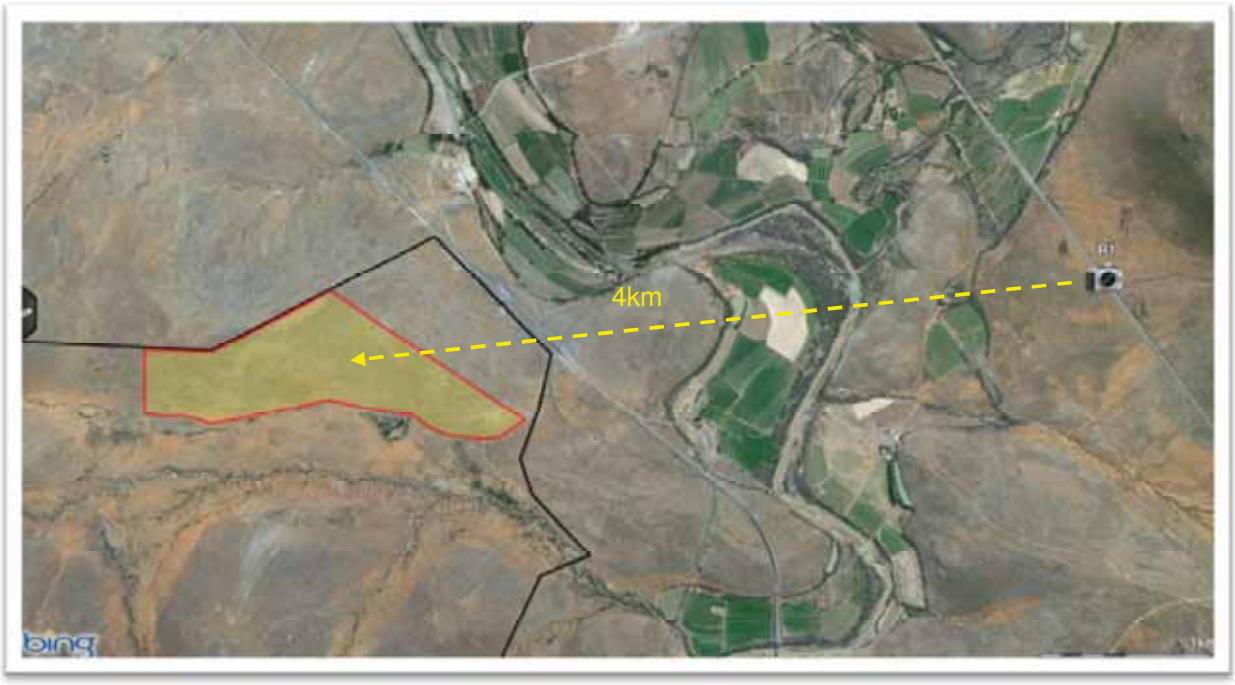
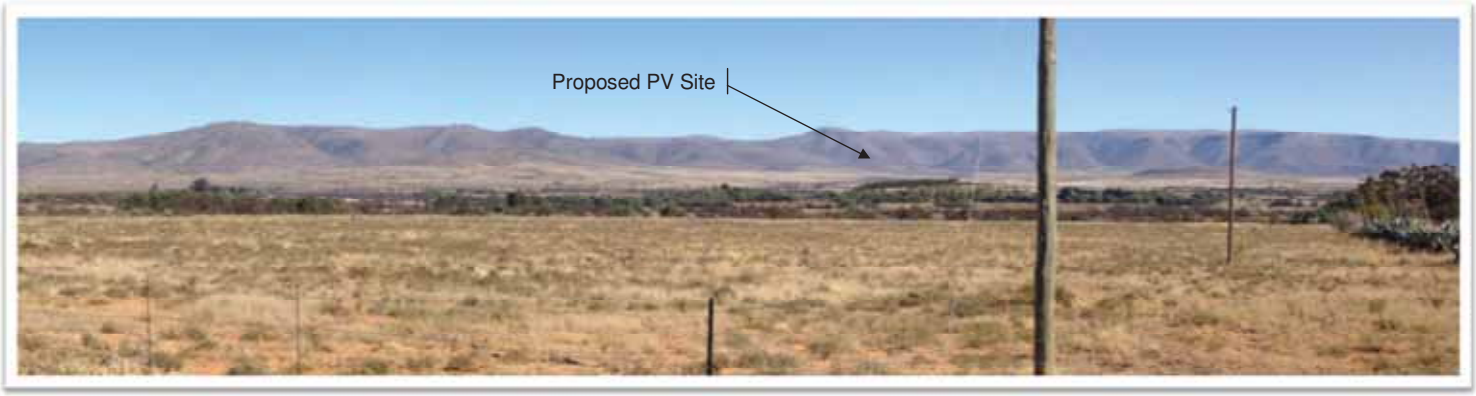


Figure 21: Key Observation Map

Existing view east from N10 towards site



Proposed PV would appear as dark shadow area in the distance without much definition or detail.

Figure 22: Receptor view: N10

12 IMPACT ASSESSMENT

Impact, as defined by South Africa's Department of Environmental Affairs and Development Planning's (DEA&DP) Guideline for involving Visual and Aesthetic Specialists in EIA processes (2005), is: 'A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space'. *(Oberholzer. 2005)*.

Based on the contrast ratings, undertaken from each of the surrounding KOP receptors, an assessment was made of the visual significance of the following visual issues:

12.1 Construction phase

Potential Impacts: Dust caused by materials haulage to and from the site, site development works.

The extent of the impacts will be mainly local and on-site with the exception of the hauling and delivery of PV parts to the site. The intensity of the visual impacts will be *low* for all of the defined construction phase. This is a consequence of the bulk of the project facing away from the receptors, which are a far distance away, and the significant screening by the site topography. The exception to this will be the visual disturbance created by the construction of the laydown and the clearing of vegetation for the construction of the PV structures. These will be experienced as a *moderate* intensity. As the site is visible from the N10, negative visual impact is likely to take place as it is a change in landuse from the existing rural landscape. Construction activities can however be reversed and the current status quo can be achieved again. Significance without mitigation is *minor* for all the impacts.

Proposed mitigation include:

- Access roads are to be kept clean, and measures taken to minimise dust from construction traffic on gravel roads.
- Surface material should be scraped off, conserved and used for rehabilitation. The remainder could be used for site development, and any surplus disposed of in a manner that appears natural.
- Lay-down area(s) should preferably be located outside of direct view from the N10 and should be screened with shade cloth.
- Site offices and structures should be limited to single storey and they should be sited carefully to reduce visual intrusion. Colours should reflect hues of the surrounding vegetation and/or the ground. Roofs should be grey and non-reflective. Door and window frame colour should reference either the roof or wall colours.
- Litter is to be regarded as a serious offence and no contaminants are to be allowed to enter the environment by any means. An Environmental Management Plan would be drawn up.
- Road construction and management must take run-off into consideration in order to prevent soil erosion.
- The top 50-100mm of naturally occurring substrate should be separated and then spread over finished levels.
- The developer will be required to ensure that the footprint areas of all impact sites utilised in construction and not in operation are rehabilitated and restored to previous natural vegetation.
- It is recommended that pylons are constructed of wooden poles.
- The fencing should be grey in colour and located as much as possible around the PV site. If possible, natural waterways and drainage lines indicated as sensitive should not be fenced in.
- Substation to be set into the ground as much as possible and the structures need to be painted a grey green colour.

With the mitigations effectively implemented, the visual significance of the construction phase could be reduced to *negligible* and the existing landscape context experienced along the N10 view corridor could be retained.

12.2 Operation phase

Potential Impacts: Lights at night and movement of maintenance vehicles.

The visual impact of lighting will be significant because it can give a project a far greater zone of visual influence at night than the structures have during the day. The extent of the visual impacts would be retained on-site and at a *local* level during the operation phase. This would include the impacts of the PV panels and the impacts of the transmission line. The duration of the impact would be long-term. Intensity would be *low* for the small aspects of the project, with the PV panels experienced as a *medium intensity* due to distance to the site and partial topographic screening. The type of impact will be *negative* as the PV structures are different to the predominantly agricultural landscape structures of the surrounding areas. With effective removal, rehabilitation, recycling and restoration, the PV impact could be reversed. Significance without mitigation is *minor* for the smaller project components, but *moderate* for the PV project as a whole.

The following mitigations were recommended:

- All lighting is to be kept to a minimum within the requirements of safety and efficiency.
- Where such lighting is deemed necessary, low-level lighting, which is shielded to reduce light spillage and pollution, should be used.
- No naked light sources are to be directly visible from a distance. Only reflected light should be visible from outside the site.
- Any necessary aircraft warning lights are to be installed as per the relevant authority requirements.
- External lighting must use down-lighters shielded in such a way as to minimise light spillage and pollution beyond the extent of the area that needs to be lit.
- Security and perimeter lighting must also be shielded so that no light falls outside the area needing to be lit. Unnecessarily tall light poles are to be avoided.
- If possible, retain the agricultural usage of the area for grazing of livestock.

With the mitigations effectively implemented, the visual significance of the operation phase could be reduced to *negligible* and the existing landscape context experienced along the N10 view corridor could be retained.

12.3 Closure phase

Potential Impacts: Removal of all PV structures, associated structures and fencing.

Ripping of all internal roads and rehabilitation to its natural state. With effective removal, rehabilitation, recycling and restoration, the PV project and associated infrastructure could be reversed. The impacts of this phase would be similar to the construction phase.

The following mitigations were recommended:

- All PV structures, associated structures and fencing should be removed and recycled.
- Internal roads should be ripped and then rehabilitated.
- All impacted footprint areas should be rehabilitated and restored to indigenous, endemic vegetation.

With the mitigations effectively implemented, the visual significance of the closure phase could be reduced to *negligible* and the existing landscape context experienced along the N10 view corridor could be retained.

12.4 Status Quo and Cumulative Visual Impacts

The significance of maintaining the No-Go option was defined as *minor* as the site is fairly remote and not utilised as a direct visual resource. From a cumulative visual impact perspective, the site is visually and proximately associated with the mountains to the south of the site. The construction of the PV project would reduce the potential for landscape based tourism of the sections of the hills and valleys

that are in view of site which cover a large section of ground. Other cumulative visual impacts defined were for operation and closure phases. In the operation phase, the impact of the expansion of the PV project resulting in a change in landuse from the current agricultural to that of a more industrial landscape, was defined as having a *major* potential significance. With effective planning which allows for the retaining of the agricultural landscape, the significance could be reduced to *moderate*. In the unlikely scenario where the PV structures were not removed after closure, landscape degradation could take place which would detract from the surrounding landscape character. As the site is small, the significance of this cumulative visual impact is defined as being *moderate*.

12.5 Impact Assessment Summary Table

	Nature of the impact	Extent	Duration	Intensity	Likelihood	Impact Type	Confidence	Reversibility	Significance	Mitigation Measures	Significance after mitigation
CONSTRUCTION PHASE											
1	Hauling and delivery of PV parts	Regional	Constr	Low	Low	-ve	Sure	Rev	Minor	Good traffic management and keeping local people informed	Neg.
3	Location of access road	Local	Constr	Low	Low	-ve	Sure	Rev	Minor	Rehabilitate after works	Neg.
4	Visual disturbance of construction site and laydown area	Local	Constr	Medium	Likely	-ve	Sure	Rev	Minor	Locate site off the ridgeline and screen, operate within Construction Industry Management Guidelines	Neg.
5	Movement of construction vehicles with lights	Local	Constr	Low	Likely	-ve	sure	Rev	Minor	No night and weekend working	Neg.
6	Construction of trenches for cables	On-site	Constr	Low	Likely	-ve	sure	Rev	Minor	Return ground to original state	Neg.
7	Construction of PV facilities and buildings	Local	Constr	Medium	Likely	-ve	sure	Rev	Minor	Use of local materials so that buildings blend in and restrict to single story in height	Neg.
8	Construction of transmission lines	Local	Constr	Low	Likely	-ve	sure	Rev	Minor	None	Neg.
9	Completion of site works and fencing	On-site	Constr	Low	Likely	-ve	sure	Rev	Minor	Good site management avoidance of litter etc	Neg.

	Nature of the impact	Extent	Duration	Intensity	Likelihood	Impact Type	Confidence	Reversibility	Significance	Mitigation Measures	Significance after mitigation
OPERATIONAL PHASE											
1	Maintenance visits using existing road access	On-site	Long-term	Low	Likely	-ve	Sure	Rev	Minor	Good management practices and dust control	Negl.
2	Visual impact of installation during lifetime (including lights at night)	Local	Long-term	Medium	Likely	-ve	Sure	Rev	Moderate	Local consultations, mitigation measures, EMP	Minor
3	Site buildings and perimeter fence	On-site	Long-term	Low	Likely	-ve	Sure	Rev	Minor	Carry out repairs promptly and keep tidy	Negl.
4	Impact of transmission line from site to adjacent Eskom line	Local	Long-term	Low	Likely	-ve	Sure	Rev	Minor	None	Minor
5	No-Go option: retaining status quo	On-site	Permanent	Negl.	Definite	+ve	Sure	Rev	Minor	Retain agricultural utilisation	NA
6	Cumulative Impacts of PV expansion	Local	Permanent	High	Definite	-ve	Sure	Permanent	Major	Effective planning to retain existing authentic rural agricultural landscape character which adds to the N10 national road view corridor	Moderate

	Nature of the impact	Extent	Duration	Intensity	Probability	Status	Confidence	Reversibility	Significance	Mitigation Measures	Significance after mitigation
CLOSURE PHASE											
1	Removal of existing road access	Local	Short-term	Low	Likely	Neutral	Certain	NA	Moderate	Ripping of roads and rehabilitation, restoration	Negl.
2	Removal of PV structures	Local	Short-term	Low	Likely	Neutral	Certain	NA	Moderate	Ripping of roads and rehabilitation, restoration and EMP	Negl.
3	Removal of site buildings and perimeter fence	Local	Short-term	Low	Likely	Neutral	Certain	NA	Moderate	Ripping of roads and rehabilitation, restoration and EMP	Negl.
4	Removal of transmission line from site to adjacent Eskom line	Local	Short-term	Low	Likely	Neutral	Certain	NA	Moderate	Ripping of roads and rehabilitation, restoration and EMP	Negl.
5	Cumulative Impacts: Non-removal of PV project and no rehabilitation	Local	Permanent	Medium	Unlikely	-ve	Unsure	Reversible	Moderate	N/A	N/A

13 CONCLUSION

Visual impact significance is predicted to be ***moderate to minor*** with effective implementation of mitigations. Should the project be granted permission, care should be taken regarding cumulative visual impacts of the project attracting other PV projects to the area. This could change the current authentic agricultural landscape which has *moderate to high* scenic quality and adds to the visual experience of receptors utilising the N10 national road. An Environmental Management Plan should be implemented, and mitigation measures must be effectively undertaken relating to:

Construction Phase

- Keeping contract period to the minimum
- Traffic control measures
- Disposal of surplus materials
- Location of lay-down areas
- Dust management plan
- Environmental Management Plan

Operational Phase

- Height, location, finishes of building(s)
- Use of non-reflective materials and receding colours
- Discussions with local community

Closure Phase

- Removal of all PV structures, associated structures and infrastructure
- Rehabilitation and restoration

14 REFERENCES

1. ASTER GDEM. METI and NASA, Source: https://lpdaac.usgs.gov
2. Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400
3. Environmental Resources Management (ERM). 2013. Final Scoping Report: Proposed 90 MW Drennan Photovoltaic (PV) Power Facility. Eastern Cape. March 2013. Solaire Direct Southern Africa (Pty) Ltd. ERM Reference: 0166587.
4. Hull, R.B. and Bishop, I.E. (1988), Scenic Impacts of Electricity Transmission Mine: The Influence of Landscape Type and Observer Distance. *Journal of Environmental Management.*1988 (27) Pg 99-108.
5. Lange, E. 1994: Integration of computerized visual Simulation and visual Assessment in environmental Planning. Landscape and Urban Planning.
6. Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.
7. Sheppard, S.R.J. 2005. Validity, reliability, and ethics in visualization. In: Bishop, I. & Lange, E. (Eds.) *Visualization in Landscape and Environmental Planning: Technology and Applications*. Taylor and Francis, London. Chapter 5, pp. 79-97. Source: www.calp.forestry.ubc.ca/Coe of Ethics_July03.pdf
8. U.K Institute of Environmental Management and Assessment (IEMA). 'Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press, 2002. Pg 44.

15 ANNEXURE 1: COLOUR PLATES

View North

View East

View South

View West

Figure 23: Views from photo point S1

View North

View East

View South

View West

Figure 24: Views from photo point S2

View North

View East

View South

View West

Figure 25: Views from photo point S3

View North

View East

View South

View West

Figure 26: Views from photo point S4

View North

View East

View South

View West

Figure 27: Views from photo point S6

16 ANNEXURE 2: SPECIALIST DECLARATION OF INDEPENDENCE

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Specialist:	VRM AFRICA CC		
Contact person:	STEPHEN STEAD		
Postal address:	P.O BOX 7233, BLANCO		
Postal code:	6531	Cell:	083 560 9911
Telephone:	044 874 0020	Fax:	086 653 3738
E-mail:	steve@vrma.co.za		
Professional affiliation(s) (if any)	Association of Professional Heritage Practitioners South Africa (APHP)		

The specialist appointed in terms of the Regulations

I, **STEPHEN STEAD**, declare that ---

General declaration:

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

Signature of the specialist:

SILVER SOLUTIONS TRADING AS VRM AFRICA

Name of company (if applicable):

23 JANUARY 2013

Date:

16.1 Curriculum Vitae

Curriculum Vitae (CV)

1. **Position**: Owner / Director
2. **Name of Firm**: Visual Resource Management Africa cc *(www.vrma.co.za)*
3. **Name of Staff**: Stephen Stead
4. **Date of Birth**: 9 June 1967
5. **Nationality:** South African
6. **Contact Details:** **Tel: +27 (0) 44 876 0020**
   Cell: +27 (0) 83 560 9911
   Email: steve@vrma.co.za

7. **Educational qualifications**:
   - University of Natal (Pietermaritzburg):
   - Bachelor of Arts: Psychology and Geography
   - Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems

8. **Professional Accreditation**
   - Association of Professional Heritage Practitioners (APHP) Western Cape
     - Accredited VIA practitioner member of the Association (2011)

9. **Association involvement:** :
   - International Association of Impact Assessment (IAIA) South African Affiliate
     - Past President (2012 - 2013)
     - President (2012)
     - President-Elect (2011)
     - Conference Co-ordinator (2010)
     - National Executive Committee member (2009)
     - Southern Cape Chairperson (2008)

10. **Conferences Attended:**
    - IAIAsa 2012
    - IAIAsa 2011
    - IAIA International 2011 (Mexico)
    - IAIAsa 2010
    - IAIAsa 2009
    - IAIAsa 2007

11. **Continued Professional Development:**
    - Integrating Sustainability with Environment Assessment in South Africa (IAIAsa Conference, 1 day)
    - Achieving the full potential of SIA (Mexico, IAIA Conference, 2 days 2011)
    - Researching and Assessing Heritage Resources Course (University of Cape Town, 5 days, 2009)

12. **Countries of Work Experience**:
    - South Africa, Mozambique, Malawi, Lesotho, Kenya and Namibia

13. **Relevant Experience:**
    Stephen gained six years of experience in the field of Geographic Information Systems mapping and spatial analysis working as a consultant for the KwaZulu-Natal Department of Health and then with an Environmental Impact Assessment company based in the Western Cape. In 2004 he set up the company Visual Resource Management Africa which specializes in visual resource management and visual impact assessments in Africa. The company makes use of the well documented Visual Resource Management methodology developed by the Bureau of Land Management (USA) for assessing the suitability of landscape modifications. In association with ILASA qualified landscape architect Liesel

Stokes, he has assessed of over 100 major landscape modifications through-out southern and eastern Africa. The business has been operating for eight years and has successfully established and retained a large client base throughout Southern Africa which include amongst other, Rio Tinto (Pty) Ltd, Bannerman (Pty) Ltd, Anglo Coal (Pty) Ltd, Eskom (Pty) Ltd, NamPower and Vale (Pty) Ltd, Ariva (Pty) Ltd, Harmony Gold (Pty) Ltd, Mellium Challenge Account (USA), Pretoria Portland Cement (Pty) Ltd

14. Languages:

- English – First Language
- Afrikaans – fair in speaking, reading and writing

15. Projects:

A list of ***some*** of the large scale projects that VRMA has assessed has been inserted below with the client list indicated per project (Refer to www.vrma.co.za for a full list of projects undertaken).

YEAR	NAME	DESCRIPTION	CLIENT	LOCATION
2012	AfrisamSaldanha	Mine	AfriSAM	Saldana
2012	Ncondezi Power Station	Plant	Ncondezi Coal	Mozambique
2012	MET Housing Etosha Amended MCDM	Residential	Millennium Challenge	Namibia
2012	Kangnas Wind	Energy	Mainstream Renewable Power SA	N Cape
2012	Kangnas PV	Energy	Mainstream Renewable Power SA	N Cape
2012	Rossing Z20 Infrastructure Corridor	Infrastructure	Rio Tinto	Namibia
2012	MET Housing Etosha	Housing	MET	Namibia
2012	Qwale Mineral Sands	Mine	Base Resources	Kenya
2012	Houhoek Substation	Transmission	Eskom	Western Cape
2012	Bannerman Etango Mine Phase 2	Mining	Bannerman	Namibia
2012	Letseng Diamond Transmission Line Upgrade	Powerline	Gem Diaminds	Lesotho
2012	Letseng Diamond Mine Projet Kholo	Mine	Gem Diamonds	Lesotho
2012	Drennan PV	PV		Eastern Cape
2012	George Social Infrastructure	Analysis	George Municipal Area	George
2012	LunsklipWindfarm	Windfarm	Bergwind	Stilbaai
2012	Hoodia Solar	PV expansion		Beaufort West
2012	Bitterfontein	Energy	WEPTEAM	N Cape
2012	Bitterfontein slopes	Slopes Analysis	WEPTEAM	N Cape
2012	Knysna Affordable Housing	Residential	Knysna Municipality	Knysna
2012	KAH Hornlee Project	Residential	Knysna Municipality	Knysna
2012	Kobong Hydro	Dam / Powerline	Lesotho Highlands Water	Lesotho
2012	Otjikoto Gold Mine	Mining	ASEC	Namibia
2012	Mozambique Gas Engine Power Plant	Plant	Sasol	Mozambique
2012	SAPPI Boiler Upgrade	Plant	SAPPI	Mpumalanga
2012	Upington CSP	solar Power	Sasol	Northern Cape
2012	Rossing Z20 Mine	Mining	Rio Tinto	Namibia
2012	Eastern Cape Mari-culture	Mari-culture	Department of Agriculture, forestry and Fisheries	Western Cape
2011	Vodacom Mast	Structure	Vodacom	Reichterbosch
2011	Weldon Kaya	Residential	Private	Plettenberg Bay
2011	Hornlee	Housing	ABSA	Knysna
2011	Erongo Uranium Rush SEA	SEA	SAIEA	Namibia
2011	Damkoppie	Residential	Private	Western Cape
2011	Moquini Hotel	Structure	Costa Zeerva Developments	Western Cape
2011	Bon Accord Nickel Mine	Mine	African Nickel	Barbeton
2011	Rossing Uranium Mine Phase 2	Mining	Rio Tinto	Namibia
2011	Rossing South Board Meeting	Mining	Rio Tinto	Namibia
2011	Floating Liquified Natural Gas Facility	Structure	PetroSA	Mossel Bay
2011	Khanyisa Power Station	Power	Anglo Coal	Western Cape

		Station		
2011	PPC Rheebieck West Upgrade	Industrial	PPC	Western Cape
2011	Vale Moatize Railway 1	Mining_rail	VALE	Mozambique
2011	Vale Moatize Coal Mine	Mining_rail	VALE	Mozambique
2011	Vale Moatize Railway 2	Mining_rail	VALE	Mozambique
2011	Vale Moatize Railway 3	Mining_rail	VALE	Mozambique
2011	Vale Moatize Railway 4	Mining_rail	VALE	Mozambique
2011	OlvynKolk PV	Solar Power		Northern Cape
2011	Beaufort West Urban Edge	Mapping	Willem de Kock Planners	Beaufort West
2011	ERF 7288 PV	PV		Beaufort West
2011	Erf 7288 Beaufort West	Slopes		Beaufort West
2011	N2 Herolds Bay Residental	Residential	MMS Developers	Herolds Bay
2011	Southern Arterial	Road	George Municipality	George
2011	De Bakke Cell Phone Mast	Mast	Vodacom	Western Cape
2011	Ruitesbosch	Mast	Vodacom	Western Cape
2011	Wadrif Dam	Dam	Plett Municipality	Western Cape
2011	George Western Bypass	Road	George Municipal Area	George
2011	Gecko Namibia	Industrial	Vision Industrial Park	
2011	Hartenbos Quarry Extension	Mining	Onifin(Pty) Ltd	Mossel Bay
2011	Wadrif Dam	Dam	Plettenberg Municipality	Beaufort West
2011	Kathu CSP	Solar Power		Northern Cape
2011	Sasolburg CSP	Solar Power		Free State
2010	George Open Spaces System	George SDF	George Municipal Area	George
2010	Sedgefield Water Works	Structure	Knysna Municipality	Sedgefield
2010	George Visual Resource Management	George SDF	George Municipal Area	George
2010	George Municipality SDF	George SDF	George Municipal Area	George
2010	Green View Estates	Residential		Mossel Bay
2010	WolweEiland Access Route	Road	Theo Ciliers	Victoria Bay
2010	AsazaniZinyoka UISP Housing	Residential	Mossel Bay Municipality	Mossel Bay
2010	MTN Lattice Hub Tower	Structure	MTN	George
2010	Destiny Africa	Residential	KDFM	George
2010	Farm Dwarsweg 260	Residential	HoogkwatierLandgoed	Great Brak
2010	Bantamsklip GIS Mapping	Mapping	Eskom	Western Cape
2010	Bantamsklip Transmission Revision	Transmission	Eskom	Eastern Cape
2010	Le Grand Golf and Residential Estate	Residenti	Private	George
2010	Ladywood Farm 437	Residential	Private	Plettenberg Bay
2010	Pezula Infill (Noetzie)	Residential	Pezula Golf Estate	Knysna
2010	Stonehouse Development	Residential	Private	Plettenberg Bay
2009	Eden Telecommunication Tower	Tower	Africon Engineering	George
2009	Walvis Bay Power Station	Structure	NamPower	Namibia.
2009	OCGT Power Plant Extension	Power Plant	Eskom	Mossel Bay
2009	Rossing Uranium Mine Phase 1	Mining	Rio Tinto	Namibia
2009	RUL Sulpher Handling Facility	Mining	Rio Tinto	Walvis Bay
2009	Boggomsbaai	Slopes	Private	Boggomsbaai
2009	Still Bay East	Mapping	DelPlan	SA, WC
2009	Bannerman Etango Uranium Mine	Mining	Bannerman	Namibia
2009	George Municipality Densification	George SDF	George Municipal Area	George
2009	Oudtshoorn Municipality SDF	Mapping	Oudtshoorn Municipality	Oudtshoorn
2009	Harmony Gold Mine	Mining	Harmony	Mpumalanga.
2009	RystKuil/RietKuil Uranium Mine	Mining	Turgis	Beaufort West
2009	Trekkopje Uranium Mine	Mining	Trekkopje Uranium Mine	Namibia
2009	Calitzdorp Retirement Village	Residential	Pretorius Family Trust	Calitzdorp
2009	Wilderness Erf 2278	Residential	Albert Hanekom	Wilderness
2009	WolweEiland Eco & Nature Estate	Residential	Theo Ciliers	Victoria Bay
2009	Zebra Clay Mine	Mining	Private	Zebra
2009	Fancourt Visualisation Modelling	Visualisation	Fancourt Golf Estate	George
2009	Erf 251 Damage Assessment	Residential	Private	Great Brak
2009	Lagoon Bay Lifestyle Estate	Residential	Lagoon Bay Estate	Glentana
2009	Lagoon Garden Estate	Residential	Dreamveldt	Great Brak
2009	Moquini Beach Hotel	Resort	Kostas Zervas	Mossel Bay

2009	Knysna River Reserve	Residential	Private	Knysna
2009	Paradyskloof Residential Estate	Residential	Private	Stellenbosch
2008	Trekkopje Desalination Plant	Structure	Trekkopje Uranium Mine	Namibia
2008	HartenbosLandgoed Phase 2	Residential	Willem van Rensburg	Hartenbos
2008	Hartenbos River Park	Residential	Adlequelle	Hartenbos
2008	Hersham Security Village	Residential	Private	Great Brak
2008	Kaaimans Project	Residential	Fritz Fenter	Wilderness
2008	Kloofsig Development	Residential	Muller Murray Trust	Vleesbaai
2008	Rheebok Development Erf 252 Apeal	Residential	Farm Searles	Great Brak
2008	Riverhill Residential Estate	Residential	Theo Cilliers	Wilderness
2008	Camdeboo Estate	Resort	Private	GraaffReinet
2008	Oasis Development	Residential	Private	Plettenberg Bay
2008	Outeniquabosch Safari Park	Residential	Private	Mossel Bay
2008	George Airport Radar Tower	Tower	ACSA	George
2008	Lakes Eco and Golf Estate	Residential	Private	Sedgefield
2008	Pinnacle Point Golf Estate	Residential	Private	Mossel Bay
2008	Paradise Coast	Residential	Private	Mossel Bay
2008	FynboskruinExtention	Residential	Ballabarn Three	Sedgefield
2008	Gansevallei	Residential	Pieter Badenhorst	Plettenberg Bay
2008	Hanglip Golf and Residential Estate	Residential	Pieter Badenhorst	Plettenberg Bay
2008	Proposed Hotel Farm Gansevallei	Resort	Wendy Floyd Planners	Plettenberg Bay
2008	Uitzicht Development	Residential	Private	Knysna
2008	Hansmoeskraal	Slopes Analysis	Private	George
2008	Kruisfontein Infill	Mapping	SetPlan George	Knysna
2008	Mount View Tourist Distination	Mapping	SetPlan	Western Cape
2008	Welgevonden	Visualisation	SetPlan George	De Rust
2008	Pierpoint Nature Reserve	Residential	Private	Knysna
2008	West Dunes	Residential	Private	Knysna
1998	Greater Durban Informal Housing Analysis	GIS	Durban Municipality	Durban

Certification:
I confirm that the above CV is an accurate description of my experience and qualifications and that I am available to serve in the position indicated for me in the proposal for this project.

Yours faithfully,

_____
Stephen Stead, Director

17 ANNEXURE 3: METHODOLOGY

Visual impact is defined as 'the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.' *(Oberholzer, B., 2005)*. As identified in this definition, 'landscapes are considerably more than just the visual perception of a combination of landform, vegetation cover and buildings, as they embody the history, landuse, human culture, wildlife and seasonal changes to an area.' *(U.K IEMA, 2002)*. These elements combine to produce distinctive local character that will affect the way in which the landscape is valued and perceived.

VRM Africa's objective is to provide Interested and Affected Parties (I&APs) and decision-makers with sufficient information to take "early opportunities for avoidance of negative visual effects." This is based on the U.K. Institute of Environmental Management and Assessment's (IEMA), and South Africa's Western Cape Department of Environmental Affairs and Development Planning's (DEA&DP), guidelines:

- "The ideal strategy for each identifiable, negative effect is one of avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation may be explored. If the consideration of mitigation measures is left to the later stages of scheme design, this can result in increased mitigation costs because early opportunities for avoidance of negative visual effects are missed."*(U.K IEMA, 2002)*.
- "In order to retain the visual quality and landscape character, management actions must become an essential part of the guidelines throughout construction and operation...Proper management actions ensure that the lowest possible impact is created by the project...
- Ongoing monitoring programmes, with regard to the control of aesthetic aspects, for all stages of the project, are a vital component, ensuring that the long-term visual management objectives are met."*(Oberholzer, B., 2005)*.

The impact assessment methodology that VRM Africa uses is based on the VRM methodology developed by the United States Bureau of Land Management (BLM) in that the study involves the measurement of contrast in the form, line, texture and colour of the proposed landscape modification, against the same elements found in the natural landscape. The contrast rating is a systematic process undertaken from KOPs surrounding the project site, and the assessment of the degree of contrast (DoC) is used to evaluate the potential visual impacts associated with the proposed landscape modifications. The method is based on the premise that the degree to which a proposed landscape modification affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape *(USA Bureau of Land Management, 2004)*.

Landscape Significance

Landscape significance is assessed in order to highlight the nature and degree of significance of the landscape context by differentiating between those landscapes of recognized or potential significance or sensitivity to modification to those landscape contexts that have low sensitivity and scenic value. 'Different levels of scenic values require different levels of management. For example, management of an area with high scenic value might be focused on preserving the existing character of the landscape, and management of an area with little scenic value might allow for major modifications to the landscape. Determining how an area should be managed first requires an assessment of the area's scenic values. Assessing scenic values and determining visual impacts can be a subjective process. Objectivity and consistency can be greatly increased by using standard assessment criteria to describe and evaluate landscapes, and to also describe proposed projects.' *(USA Bureau of Land Management. 2004)*.

Viewshed Analysis

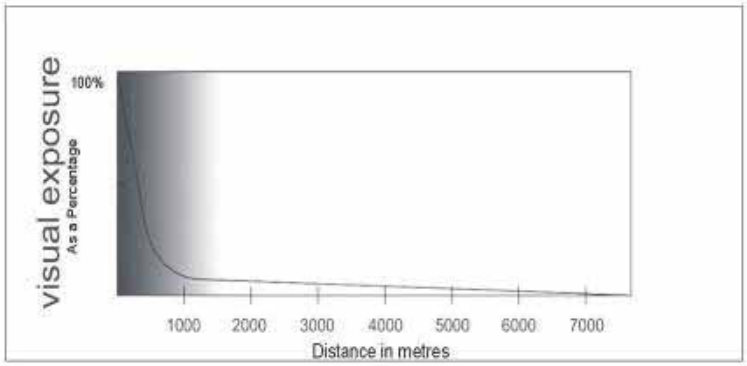
A viewshed is 'the outer boundary defining a view catchment area, usually along crests and ridgelines' *(Oberholzer, B., 2005)*. This reflects the area within which, or the extent to which, the landscape modification is likely to be seen. It is important to assess the extent to which the proposed landscape modifications are visible in the surrounding landscape, as a point of departure for defining the shared landscape context, and to identify the receptors making use of the common views. Viewshed analyses are not absolute indicators of the level of significance, but an indication of

potential visibility*(Centre for Advanced Spatial Analysis, 2002)*. Once the sites and heights of the proposed activities have been finalised, the viewshed analysis will be undertaken.

Receptor Exposure

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined by the U.K. Institute of Environmental Management and Assessment's (IEMA) *'Guidelines for Landscape and Visual Impact Assessment'* as 'the area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The inverse relationship of distance and visual impact is well recognised in visual analysis literature *(Hull, R.B. and Bishop, I.E., 1988)*. According to Hull and Bishop, exposure, or visual impact, tends to diminish exponentially with distance. The areas where most landscape modifications would be visible are located within 2 km from the site of the landscape modification. Thus the potential visual impact of an object diminishes at an exponential rate as the distance between the observer and the object increases due to atmospheric conditions prevalent at a location, which causes the air to appear greyer, thereby diminishing detail. For example, viewed from 1000 m from a landscape modification, the impact would be 25% of the impact as viewed from 500 m from a landscape modification. At 2000m it would be 10% of the impact at 500 m. The relationship is indicated in the following graph generated by Hull and Bishop.



17.1 Distance Zones

The VRM methodology also takes distance from a landscape modification into consideration in terms of understanding visual resource. Three distance categories are defined by the Bureau of Land Management. The distance zones are:

1. ***Foreground / Middle ground***, up to approximately 6km, which is where there is potential for the sense of place to change;
2. ***Background areas***, from 6km to 24km, where there is some potential for change in the sense of place, but where change would only occur in the case of very large landscape modifications; and
3. ***Seldom seen areas***, which fall within the Foreground / Middle ground area but, as a result of no receptors, are not viewed or are seldom viewed.

17.2 Scenic Quality

In the VRM methodology, scenic quality is a measure of the visual appeal of a tract of land. In the visual resource inventory process, public lands are given a rating based on the apparent scenic quality, which is determined using seven key factors. During the rating process, each of these factors is ranked on a comparative basis with similar features in the region *(USA Bureau of Land Management, 2004)*. These seven elements are:

1. **Landform:** Topography becomes more interesting as it gets steeper, or more massive, or more severely or universally sculptured.
2. **Vegetation:** Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Also consider smaller-scale vegetation features which add striking and intriguing detail elements to the land.

3. **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
4. **Colour:** Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast and harmony.
5. **Scarcity:** This factor provides an opportunity to give added importance to one, or all, of the scenic features that appear to be relatively unique or rare within one physiographic region.
6. **Adjacent Land Use:** Degree to which scenery, outside the scenery unit being rated, enhances the overall impression of the scenery within the rating unit. The distance at which adjacent scenery will start to influence scenery within the rating unit ranges, depending upon the characteristics of the topography, the vegetative cover, and other such factors.
7. **Cultural Modifications:** Cultural modifications in the landform, water, and vegetation, and addition of structures, should be considered, and may detract from the scenery in the form of a negative intrusion, or complement or improve the scenic quality of a unit.

Receptor Sensitivity Rating Criteria
A= scenic quality rating of ≥19;
B = rating of 12 – 18,
C= rating of ≤11

Scenic Quality Rating Questionnaire

KEY FACTORS	**RATING CRITERIA AND SCORE**		
SCORE	**5**	**3**	**1**
Land Form	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations including dune systems: or detail features that are dominating and exceptionally striking and intriguing.	Steep-sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting, though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.

Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing etc.	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
SCORE	**2**	**0**	**-4**
Cultural Modification	Modifications add favourably to visual variety, while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

17.3 Receptor Sensitivity

Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high, medium or low sensitivity levels by analysing the various indicators of public concern. The following criteria were used to assess the sensitivity of each of the communities:

- **Public Interest:** The visual quality of an area may be of concern to local, state, or national groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, landuse plans, etc. Public controversy, created in response to proposed activities that would change the landscape character, should also be considered.
- **Special Areas:** Management objectives for special areas such as natural areas, wilderness areas or wilderness study areas, wild and scenic rivers, scenic areas, scenic roads or trails, and Areas of Critical Environmental Concern (ACEC), frequently require special consideration for the protection of visual values. This does not necessarily mean that these areas are scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.
- **Adjacent Land Uses:** The interrelationship with land uses in adjacent land can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.
- **Type of User:** Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- **Amount of Use:** Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase *(USA Bureau of Land Management, 2004)*.

Receptor Sensitivity Rating Criteria

The level of visual impact considered acceptable is dependent on the types of receptors.

- *High sensitivity : e.g. residential areas, nature reserves and scenic routes or trails*
- *Moderate sensitivity : e.g. sporting or recreational areas, or places of work*
- *Low sensitivity : e.g. industrial, mining or degraded areas*

Sensitivity Level Rating Questionnaire

FACTORS	**QUESTIONS**	
Type of Users	**Maintenance of visual quality is:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low

Amount of use	**Maintenance of visual quality becomes more important as the level of use increases:**	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	**Maintenance of visual quality:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Adjacent land Users	**Maintenance of visual quality to sustain adjacent land use objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	**Maintenance of visual quality to sustain Special Area management objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

17.4 Key Observation Points (KOPs)

KOPs are defined by the BLM Visual Resource Management as the people located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are used to assess the suitability of the proposed landscape modifications by means of assessing the degree of contrast of the proposed landscape modifications to the existing landscape, taking into consideration the visual management objectives defined for the area. The following selection criteria were utilised in defining the KOPs:

- Angle of observation
- Number of viewers
- Length of time the project is in view
- Relative project size
- Season of use
- Critical viewpoints, e.g. views from communities, road crossings
- Distance from property

17.5 VRM Classes

The landscape character of the proposed project site is surveyed to identify areas of common landuse and landscape character. These areas are then evaluated in terms of scenic quality (landscape significance) and receptor sensitivity to landscape change (of the site) in order to define the visual objective for the project site. The overall objective is to maintain a landscape's integrity, but this can be achieved at varying levels, called VRM Classes, depending on various factors, including the visual absorption capacity of a site (i.e., how much of the project would be "absorbed" or "disappear" into the landscape). The areas identified on site are categorised into these Classes by using a matrix from the BLM Visual Resource Management method as seen below, which is then represented in a visual sensitivity map

The BLM has defined four Classes that represent the relative value of the visual resources of an area:

iv. **Classes I and II** are the most valued
v. **Class III** represent a moderate value

vi. **Class IV** is of least value

		VISUAL SENSITIVITY LEVELS								
		High			Medium			Low		
SCENIC QUALITY	A (High)	II	II	II	II	II	II	II	II	II
	B (Medium)	II	III	III/ IV *	III	IV	IV	IV	IV	IV
	C (Low)	III	IV	IV	IV	IV	IV	IV	IV	IV
DISTANCE ZONES		fore/middle ground	Background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

(A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11)

* If adjacent areas are **Class III** or lower, assign **Class III**, if higher, assign **Class IV**

Evaluation of the suitability of a proposed landscape modification is undertaken by means of assessing the proposed modification against a predefined management objective assigned to each class. The VRM class objectives are defined as follows:

1. The **Class I** objective is to preserve the existing character of the landscape, where the level of change to the characteristic landscape should be very low, and must not attract attention. **Class I** is assigned to those areas where a ***specialist decision*** has been made to maintain a natural landscape.
2. The **Class II** objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.
3. The **Class III** objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
4. The **Class IV** objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high, and these management activities may dominate the view and be the major focus of the viewer's (s') attention.

17.6 Photo Montages and 3D Visualisation

As a component in this contrast rating process, visual representation, such as photo montages are vital in large-scale modifications, as this serves to inform I&APs and decision-making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process, as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003)*(Sheppard, S.R.J., 2005)*. This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes, providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity
- Interest

The Code of Ethical Conduct states that the presenter should:

- Demonstrate an appropriate level of qualification and experience.
- Use visualisation tools and media that are appropriate to the purpose.
- Choose the appropriate level of realism.
- Identify, collect and document supporting visual data available for, or used in, the visualisation process.
- Conduct an on-site visual analysis to determine important issues and views.
- Seek community input on viewpoints and landscape issues to address in the visualisations.
- Provide the viewer with a reasonable choice of viewpoints, view directions, view angles, viewing conditions and timeframes appropriate to the area being visualised.
- Estimate and disclose the expected degree of uncertainty, indicating areas and possible visual consequences of the uncertainties.
- Use more than one appropriate presentation mode and means of access for the affected public.
- Present important non-visual information at the same time as the visual presentation, using a neutral delivery.
- Avoid the use, or the appearance of, 'sales' techniques or special effects.
- Avoid seeking a particular response from the audience.
- Provide information describing how the visualisation process was conducted and how key decisions were taken*(Sheppard, S.R.J., 2005)*.

17.7 Contrast Rating Stage

The contrast rating, or impacts assessment phase, is undertaken after the inventory process has been completed and the proposed landscape modification is assessed from the Key Observation Point. The suitability of landscape modification is assessed by measuring the Degree of Contrast (DoC) of the proposed landscape modification to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape in terms of the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None** :The element contrast is not visible or perceived.
- **Weak** :The element contrast can be seen but does not attract attention.
- **Moderate** :The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong** :The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is to provide for management activities which require major modifications of the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

17.8 VRM Terminology

The following terms were used in the Contrast Rating Tables to help define Form, Line, Colour, and Texture. The definitions were a combination of Microsoft Word Dictionary and simple description.

FORM	LINE	COLOUR	TEXTURE
Simple	Horizontal		Smooth
Weak	Vertical		Rough
Strong	Geometric		Fine
Dominant	Angular		Coarse
Flat	Acute		Patchy
Rolling	Parallel		Even
Undulating	Curved	Dark	Uneven
Complex	Wavy	Light	Complex
Plateau	Strong	Mottled	Simple
Ridge	Weak		Stark
Valley	Crisp		Clustered
Plain	Feathered		Diffuse
Steep	Indistinct		Dense
Shallow	Clean		Scattered
Organic	Prominent		Sporadic
Structured	Solid		Consistent

Simple	Basic, composed of few elements	**Organic**	Derived from nature; occurring or developing gradually and naturally
Complex	Complicated; made up of many interrelated parts	**Structure**	Organised; planned and controlled; with definite shape, form, or pattern
Weak	Lacking strength of character	**Regular**	Repeatedly occurring in an ordered fashion
Strong	Bold, definite, having prominence	**Horizontal**	Parallel to the horizon
Dominant	Controlling, influencing the surrounding environment	**Vertical**	Perpendicular to the horizon; upright
Flat	Level and horizontal without any slope; even and smooth without any bumps or hollows	**Geometric**	Consisting of straight lines and simple shapes
Rolling	Progressive and consistent in form, usually rounded	**Angular**	Sharply defined; used to describe an object identified by angles
Undulating	Moving sinuously like waves; wavy in appearance	**Acute**	Less than 90°; used to describe a sharp angle
Plateau	Uniformly elevated flat to gently undulating land bounded on one or more sides by steep slopes	**Parallel**	Relating to or being lines, planes, or curved surfaces that are always the same distance apart and therefore never meet
Ridge	A narrow landform typical of a highpoint or apex; a long narrow hilltop or range of hills	**Curved**	Rounded or bending in shape
Valley	Low-lying area; a long low area of land, often with a river or stream running through it, that is surrounded by higher ground	**Wavy**	Repeatedly curving forming a series of smooth curves that go in one direction and then another
Plain	A flat expanse of land; fairly flat dry land, usually with few trees	**Feathered**	Layered; consisting of many fine parallel strands
Steep	Sloping sharply often to the extent of being almost vertical	**Indistinct**	Vague; lacking clarity or form
Prominent	Noticeable; distinguished, eminent, or well-known	**Patchy**	Irregular and inconsistent;
Solid	Unadulterated or unmixed; made of the same material throughout; uninterrupted	**Even**	Consistent and equal; lacking slope, roughness, and irregularity
Broken	Lacking continuity; having an uneven surface	**Uneven**	Inconsistent and unequal in measurement irregular
Smooth	Consistent in line and form; even textured	**Stark**	Bare and plain; lacking ornament or relieving features
Rough	Bumpy; knobbly; or uneven, coarse in texture	**Clustered**	Densely grouped
Fine	Intricate and refined in nature	**Diffuse**	Spread through; scattered over an area
Coarse	Harsh or rough to the touch; lacking detail	**Diffuse**	To make something less bright or intense

Photo Montages and 3D Visualisation

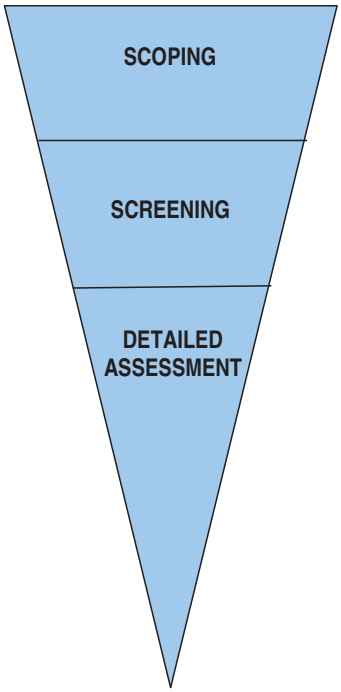
As a component in this contrast rating process, visual representation, such as photo montages, are vital in large-scale modifications, as this serves to inform I&APs and decision-making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process, as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003) (Sheppard, S.R.J., 2005). This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes, providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity
- Interest

17.9 ERM Impact Assessment Methodology

Impact Assessment Process

The following diagram describes the impact identification and assessment process through scoping, screening and detailed impact assessment. The methodology for detailed impact assessment is outlined below.



Interactions between project activities and environmental and social receptors are identified for further assessment. Areas where interactions are not expected to occur are 'scoped out' of the assessment.

Potential interactions are further evaluated against site-specific conditions using information gathered through baseline studies. Interactions are 'screened out' if the potential for impact does not exist or is negligible.

Interactions with potential for impact are assessed in detail to determine the nature and characteristics. Mitigations are applied and the residual impact is re-assessed. The significance of the residual impact is then reported.

Detailed Assessment Methodology

The purpose of impact assessment and mitigation is to identify and evaluate the significance of potential impacts 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.

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 the table below. Impacts are also described as *associated*, those that will occur, and *potential,* those that may occur.

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 the table below. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown below. For ease of review, the significance is colour-coded in the text according to the colours outlines the various definitions for 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.

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	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (i.e. 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.

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

Significance Colour Scale

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

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.

18 ANNEXURE 4: GENERAL MITIGATIONS

Lights at Night

Due to the lack of development and the remoteness of the area, the surrounding mountainous areas have a strong wilderness appeal, which is reinforced by a dark sky at night. Lights at night have the effect of increasing the visual presence to that of a much wider area if not managed. Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the mine, without jeopardising mine operational safety and security.

Mitigation:

- Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the mine, without jeopardising mine operational safety and security (See lighting mitigations by The New England Light Pollution Advisory Group (NELPAG) and Sky Publishing Corp in 14.2).
- Utilisation of specific frequency LED lighting with a green hue on perimeter security fencing.
- Directional lighting on the more exposed areas of operation, where point light source is an issue.
- No use of overhead lighting and, if possible, locate the light source closer to the operation.
- If possible, the existing overhead lighting method utilised at the mine should be phased out and replaced with an alternative lighting using closer to source, directed LED technology.

Mesopic Lighting

Mesopic vision is a combination of photopic vision and scotopic vision in low, but not quite dark, lighting situations. The traditional method of measuring light assumes photopic vision and is often a poor predictor of how a person sees at night. The light spectrum optimized for mesopic vision contains a relatively high amount of bluish light and is therefore effective for peripheral visual tasks at mesopic light levels. *(CIE, 2012)*

The Mesopic Street Lighting Demonstration and Evaluation Report by the Lighting Research Centre (LRC) in New York found that the 'replacement of white light sources (induction and ceramic metal halide) were tuned to optimize human vision under low light levels while remaining in the white light spectrum. Therefore, outdoor electric light sources that are tuned to how humans see under mesopic lighting conditions can be used to reduce the luminance of the road surface while providing the same, or better, visibility. Light sources with shorter wavelengths, which produce a "cooler" (more blue and green) light, are needed to produce better mesopic vision. Based on this understanding, the LRC developed a means of predicting visual performance under low light conditions. This system is called the unified photometry system. Responses to surveys conducted on new installations revealed that area residents perceived higher levels of visibility, safety, security, brightness, and colour rendering with the new lighting systems than with the standard High-Purity Standards (HPS) systems. The new lighting systems used 30% to 50% less energy than the HPS systems. These positive results were achieved through tuning the light source to optimize mesopic vision. Using less wattage and photopic luminance also reduces the reflectance of the light off the road surface. Light reflectance is a major contributor to light pollution (sky glow).' *(Lighting Research Center. New York. 2008)*

'Good Neighbour – Outdoor Lighting'

Presented by the New England Light Pollution Advisory Group (NELPAG) http://cfa/ www.harvard .edu /cfa/ps/nelpag.html) and Sky & Telescope http://SkyandTelescope.com/). NELPAG and Sky & Telescope support the International Dark-Sky Association (IDA) (http://www.darksky.org/).

What is good lighting? Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned? Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the night-time environment and neighbours' property values. Light directed uselessly above the horizon creates murky skyglow — the "light pollution" that washes out our view of the stars.

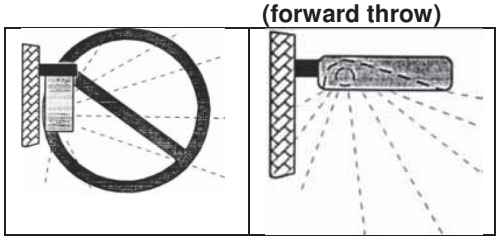
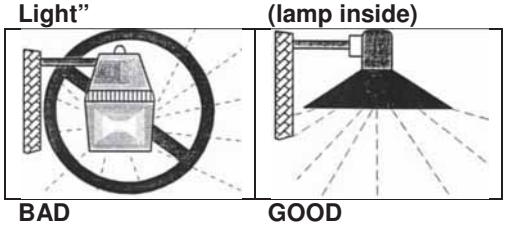
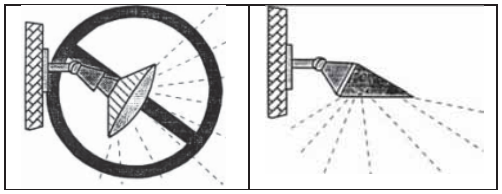
Glare Here's the basic rule of thumb: If you can see the bright bulb from a distance, it's a bad light. With a good light, you see lit ground instead of the dazzling bulb. "Glare" is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass Poor outdoor lighting shines onto neighbours' properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

Good and Bad Light Fixtures

Typical "Wall Pack"	**Typical "Shoe Box" (forward throw)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down
Typical "Yard Light"	**Opaque Reflector (lamp inside)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down
Area Flood Light	**Area Flood Light with Hood**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

How do I switch to good lighting?

Provide only enough light for the task at hand; don't over-light, and don't spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbours or polluting the sky.

1. Aim lights down. Choose “full-cutoff shielded” fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.

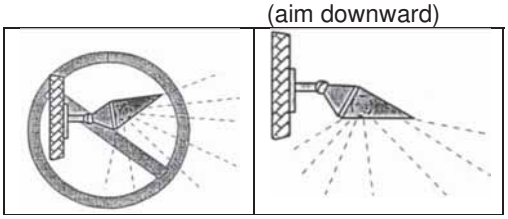
2. Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.

3. If color discrimination is not important, choose energy-efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If “white” light is needed, fixtures using compact flourescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapor bulbs.

4. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

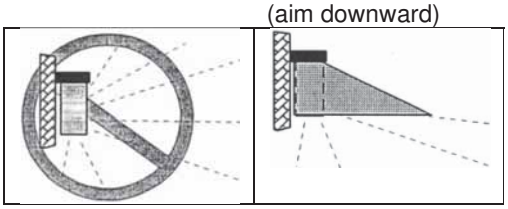
What You Can Do To Modify Existing Fixtures

Change this . . . to this (aim downward)



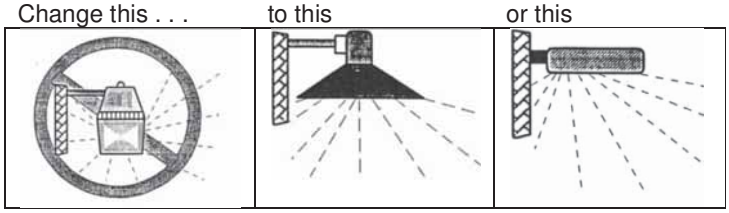
Floodlight:

Change this . . . to this (aim downward)



Wall Pack

Change this . . . to this or this



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Annex I

Agricultural Specialist Report

ENVIRONMENTAL RESOURCES MANAGEMENT

Proposed Drennan PV Solar Park

EIA Phase Soil and Agricultural Assessment Report

Issue Date: 23rd May 2013
Revision No.: 2.1
Project No.: 11587

Date:	23rd May 2013
Document Title:	Proposed Drennan PV Solar Park: EIA Phase Soil and Agricultural Assessment Report
Author:	Kurt Barichievy (*Pr.Sci.Nat.*)
Revision Number:	# 2.1
Checked by:	Dr. Richard Kinvig (*Pr.Sci.Nat.*)
Approved:	Dr. Richard Kinvig (*Pr.Sci.Nat.*)
Signature:	
For:	Environmental Resources Management
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Declaration

I, Kurt Barichievy, declare that I –

- act as an independent specialist consultant for the **soil and agricultural assessment report for the Proposed Drennan PV Solar Park, Eastern Cape Province**;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006; and
- will provide the competent authority with access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not.

Mr. K. R. Barichievy *Pr.Sci.Nat*
Scientist
SiVEST Civil Engineering Division

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1. INTRODUCTION AND TERMS OF REFERENCE

Environmental Resources Management (ERM) on behalf of **Solaire Direct** requested a baseline assessment of the soil, land use and agricultural characteristics for the area affected by the proposed Drennan Solar Energy Facility, in the Eastern Cape Province of South Africa.

The primary objective of this assessment is to provide specialist soil and agricultural input into the overarching Environmental Impact Assessment. This report serves to summarise such a study, present the relevant results and mitigate the predicted impacts on local soil and agricultural resources.

This assessment includes a detailed soil survey, the Terms of References encompass:

- The Identification of the soil forms present on site;
- The size of the area where a particular soil form is found;
- GPS readings of soil survey points;
- The depth of the soil at each survey point;
- Soil colour;
- Limiting factors;
- Slope of the site;
- A detailed map indicating the locality of the soil forms within the specified areas.
- Description of current activities on the sites, developments and buildings;
- Description of surrounding developments/ land uses and activities in a radius of 500 m of the sites, access routes and the condition thereof, the current status of the land (including erosion, vegetation and a degradation assessment) and possible land use options for the sites;
- Description of water availability, source and quality (if available);
- Undertake an assessment investigating the potential impacts on agriculture potential / production as a result of the proposed development; and
- Description of potential mitigation measures to reduce or eliminate the potential agricultural impacts identified.

It is hoped that this assessment, along with the other specialist studies, will indicate which areas to avoid due to high environmental sensitivity, and thus minimise the predicted impacts on the receiving environment.

1.1 Brief Description of the Project and Study Area

The purpose of this section is to provide basic site information for later reference. Please note that a more detailed description of the site's characteristics is provided in **Sections 3** through **6** of this report.

Solaire Direct proposes to construct a 90 Mega Watt Photovoltaic (PV) solar power facility and associated infrastructure within Portions 15 (of Portion 1) of the Farm Waai Plaats (No. 550) which constitutes approximately 1783 ha (**Figure 1**). The proposed 90 Mega Watt facility has an estimated developmental footprint of 110 ha. The power generated by the project would be transmitted to the national grid via a new "loop-in loop-out" substation.

The proposed site is situated in the Inxuba Yethemba Local Municipality. The current landowner, Mr. Wentzel Lombard, has entered into negotiations, which will see a long term land lease agreement

being finalised with Solaire Direct for the proposed solar development. The influenced farm is zoned as agricultural land and is characterised by vast grazing land for sheep, cattle and game. More intensive agricultural activities are located on either side of the Great Fish River, which runs to the east of the assessment area.

The topography of the study area is a mix of open plains, riparian areas and steeper slopes. Access to the site is obtained via the **N10** and the **R390**. The both the access and internal roads are in good condition.

Other nearby infrastructure includes a railway line and power lines. Water is the major limiting factor to local agricultural enterprises and cultivation away from the Great Fish River floodplain is generally not commercially sustainable.

The site has the following midpoint co-ordinate:

32° 27' 47.53" S 25° 42' 54.16"E

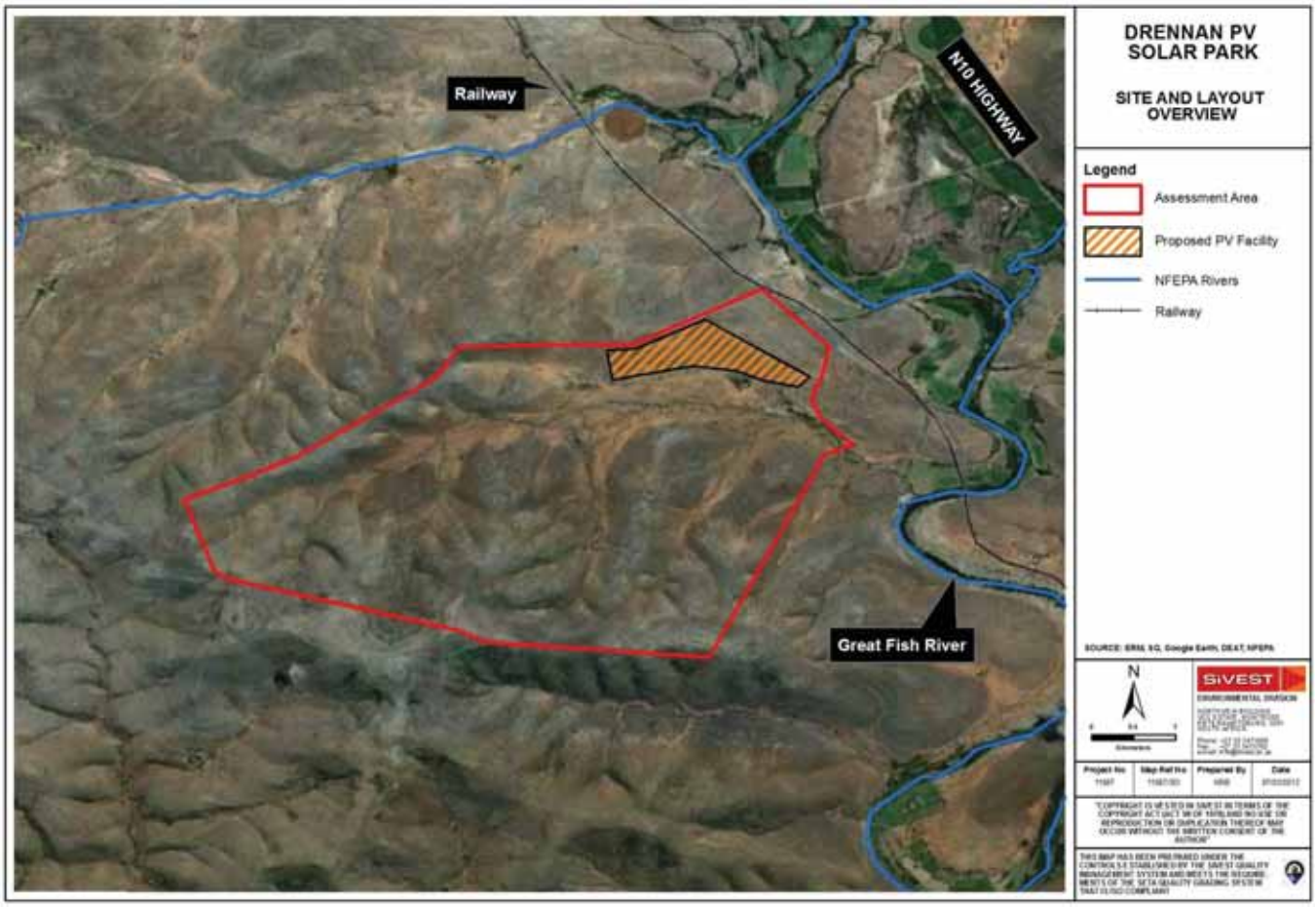

Figure 1: Site Overview Map

1.2 Description of Proposed Activities and Technical Details

The technical details provided in this Section are primarily extracted from the Drennan Draft Scoping Report produced by **ERM** (**2012**). It is anticipated that the project, when fully completed, will feed a total of 90 MW's into the national grid. The key components of the proposed PV power plant are as follows:

- PV solar panels/modules (arranged in arrays);
- PV module mountings;
- DC-AC current inverters and transformers;
- New 'loop-in loop-out' substation facilitating connection to the national electricity grid;
- 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.

The total area of the proposed development, including the PV panel arrays, will occupy approximately 110 ha (1.1 km^2) of the site. The PV panels will be 1660 mm in length, 990 mm in width and 45 mm in depth, with each panel producing an output of 250W. Each PV panel will be placed in a black or raw anodized aluminum 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 1 MW each (around 249500 PV panels will be installed on a 90 MW project). The PV panels will be mounted on aluminum fixed frame structures approximately 3.33 m in height from the ground (**Figure 2**). The aluminum 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 the maximum amount of sunlight.

Figure 2: PV Frames and panel arrays (Source: Solaire Direct and ERM, 2012)

The PV panel arrays will be connected via underground cables (at a depth of 800 mm) to array enclosures. 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. The 132 kV power supply from the new 'loop-in loop-out' substation

will be connected to the existing 132kV Transmission Line, which feeds the Eskom Drennan Traction Substation, located to the north of the Site on the east side of the railway line. This connection shall be achieved by breaking the existing 132 kV line and then connecting two overhead power lines of approximately 250 m in length to the new 'loop-in loop-out' substation of the PV power facility. Both power lines will be installed on the same steel lattice structure, according to Eskom specifications (**ERM and Solaire Direct, 2013**).

The site will be accessed from the R310 gravel road running near the eastern border of the site. 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.

A site perimeter fence (electrical palisade fencing of approximately 2.8 m in height) including access gates, guard house and associated buildings will complete the project.

2. METHODOLOGY

The following methodology was followed in order to ascertain the *status quo* of soil and agricultural resources within the study area, and further, to outline the predicted impacts resulting from the proposed development and activities in the Proposed Development Area (PDA).

2.1 Desktop Study

A detailed desktop assessment was undertaken for the Drennan Site and surrounds land. The objective of this study was to broadly evaluate the soil and land use of the sites and receiving environment by interrogating relevant climate, topographic, land-use and soil datasets. By utilising the available data resources the relevant specialist was able to broadly assess the current soil, agricultural and land use characteristics and provide a basis for a more detailed and spatially relevant assessment.

2.2 Soil Survey

A detailed soil survey was conducted for the Drennan Site. At each sample point a hand auger was used to identify and describe the diagnostic horizons to form and family level according to "Soil Classification - A Taxonomic System for South Africa" as well as noting relevant soil characteristics such as depth, texture and limiting layers. At each auger point the relevant soil and land use data was recorded and the location of the auger point captured using a handheld GPS. This information was combined to produce detailed soil polygon and soil depth maps.

2.4 Agricultural Potential Assessment

In terms of this study, agricultural potential is described as an area's suitability and capacity to sustainably accommodate an agricultural land use. The soil information gained from the survey along with the land use assessment is combined with climate, water resource, crop information and

topographic data in order to provide a spatial classification of the land based on its agricultural potential. A study of local agricultural practices was also carried out.

2.5 Impact Assessment

The impact assessment utilises the findings of the soil survey and agricultural potential assessment in order to determine reference conditions of the soil and agricultural resources. Potential soil and agricultural impacts, as a result of the proposed activities, are described in this section and any major impacts/fatal flaws will be identified for consideration by the pertinent authorities.

3. DESKTOP AGRICULTURAL POTENTIAL ASSESSMENT

The objective of the desktop component of this assessment is to provide broad soil and agriculturally related characteristics of the project area. It should be clearly noted that, since the spatial information used to drive this portion of the assessment is of a reconnaissance nature, only large scale climate, land use and soil details are provided. More detailed and site specific information are provided in subsequent Sections of this report (**Sections 4, 5 and 6**).

Existing high level GIS data was sourced from National GIS Datasets as well as the Environmental Potential Atlas for South Africa (ENPAT) Database for the Eastern Cape Province of South Africa, compiled by the Department of Environmental Affairs and Tourism (**DEAT**, **2001**). The main purpose of ENPAT is to proactively indicate potential conflicts between development plans and critical, endangered or sensitive environments. More agriculturally relevant spatial information was obtained from the AGIS Database (***http://www.agis.agric.za)***.

3.1 Climate

The study area has a continental climate with a late summer rainfall regime i.e. most of the rainfall is confined to summer and autumn. The rainfall data for the study area was sourced from the Rainfall Atlas for South Africa. According to this database the Mean Annual Precipitation (MAP) for the project area is approximately 379 mm per year with 67% of this falling between November and April (**Figure 3**).

A MAP of 379 mm is deemed low, as 500 mm is considered the minimum amount of rain required for sustainable dry land farming (**Smith, 2006**). Thus, without some form of supplementary irrigation, natural rainfall for the study area is insufficient to produce sustainable harvests. The low rainfall and moisture availability restrictions are reflected in the lack of cultivation away from riparian areas and / or irrigation infrastructure. The region typically experiences hot days with an average mid-day temperature of 29 ^{o}C in summer, while average night time temperatures drop to around 2 ^{o}C during winter (**http://www.saexplorer.co.za**). Frost, which can damage certain crops, is common during the winter months.

In summary the climate for the study area is moderately to highly restrictive, in particular to dry land arable agriculture. This is primarily attributed to low, seasonal rainfall, a large moisture deficit and frost hazard.

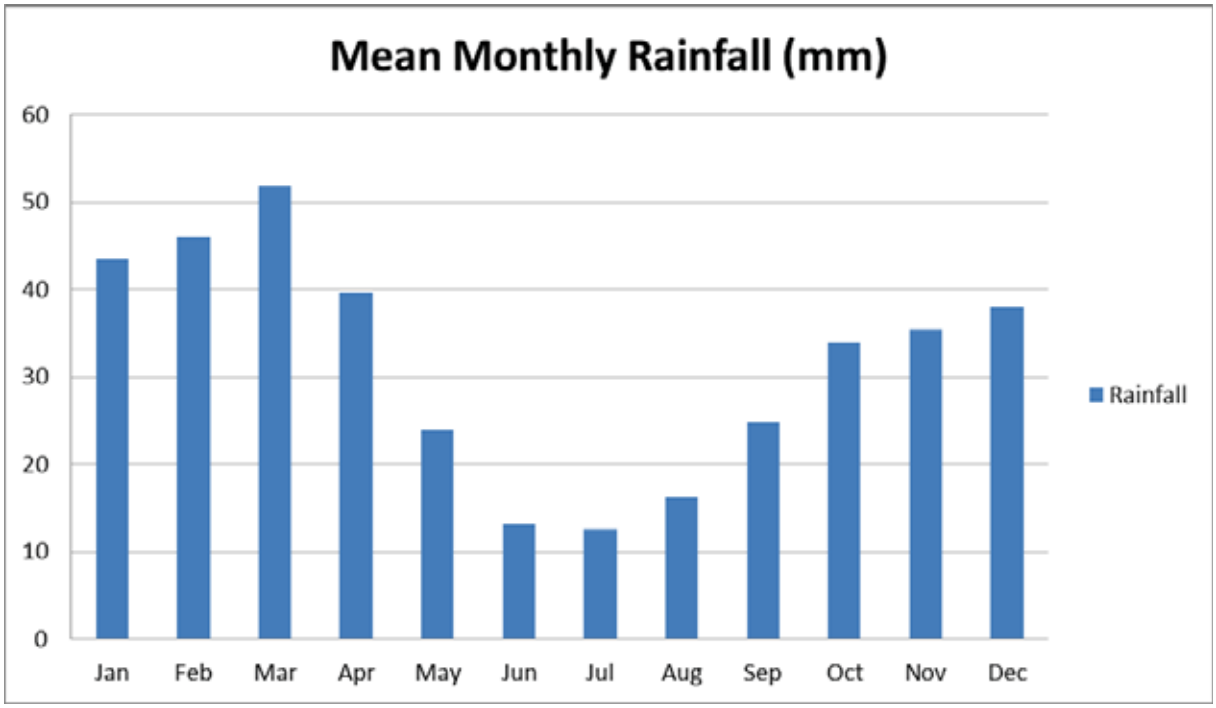

Figure 3: Mean monthly rainfall graph for the study area (**Source: South African Rainfall Atlas**)

3.2 Geology

The study area is underlain by mudstone and Dolerite (**Figure 4**). 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. Dolerite geological materials underlie the central areas as well as the southern boundary of the site.

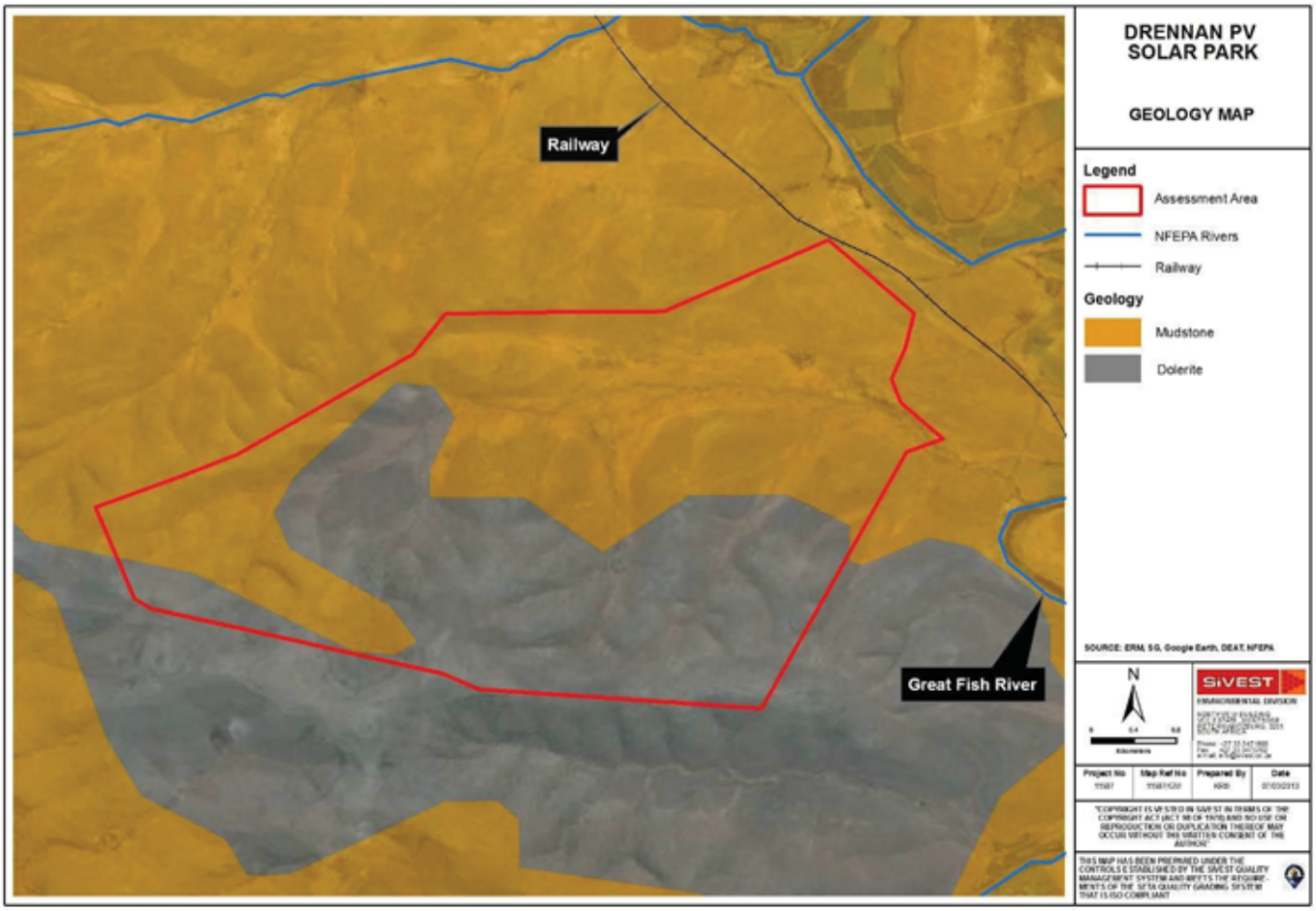

Figure 4: Geological map

3.3 Terrain

Slope, or terrain, is used to describe the lie of the land. Terrain influences climate and soil characteristics, and thus plays a dominant role in determining whether land is suitable for agriculture. In most cases sloping land is more difficult to cultivate and usually less productive than flatland, and is subject to higher rates of water runoff and soil erosion (**FAO, 2007**).

Around 70% of the assessment area is dominated by steeper slopes and rocky outcrops (**Figure 5**). These areas are limiting to arable agriculture and are also associated with numerous engineering constraints.

The remaining 30% of the area consists of gently sloping grazing land, interspersed with episodic stream beds and excavated stock watering impoundments. These flatter areas are found in the north east corner of the site. From a purely topographical standpoint these areas are ideal for intensive agriculture with a high potential for large scale mechanisation. From a developmental perspective, these flatter areas will also allow for minimal earthworks and site preparation.

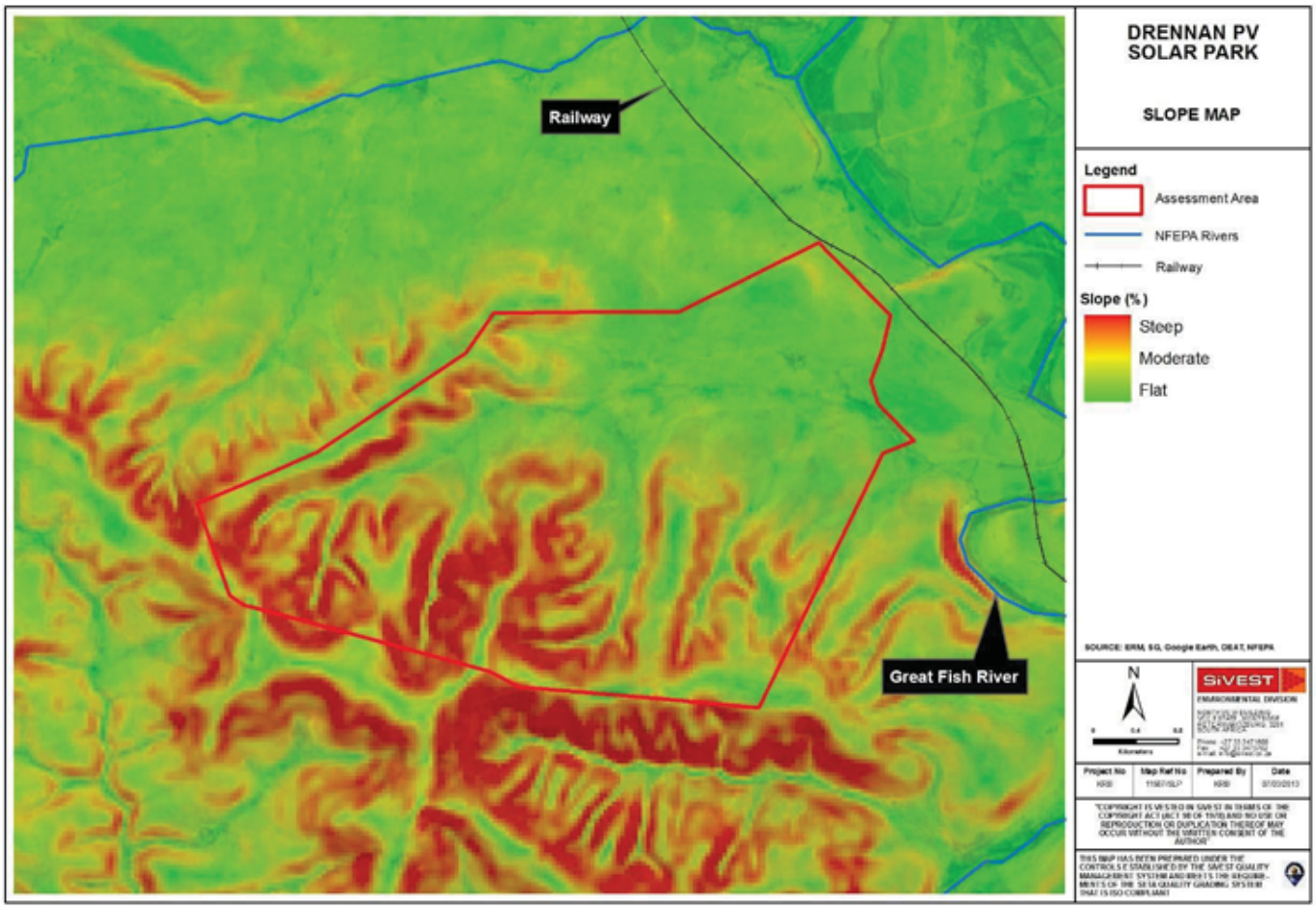

Figure 5: Digital Terrain Model and Slope Analysis of the study area

3.4 Land Cover

According to Mucina and Rutherford (**2006**) the study area is classified as a mix of Great Fish Thicket, Eastern Upper Karoo and Southern Karoo Riviere vegetation types. The entire Drennan Site consists of a mix of natural veld and vacant land which is used as general grazing land for livestock (**Figure 6**). Vast un-improved grazing land is interspersed by non-perennial stream beds and stock watering impoundments.

The exception to this generalised landscape pattern is to the east of the site which contains a number of irrigated fields. These lands are concentrated in valley bottoms and adjacent to the Great Fish River. It is assumed that the position of these fields is a function of soil moisture, deeper soil profiles and water availability for irrigation purposes. These areas are well away from the site and and will not be influenced by the proposed development.

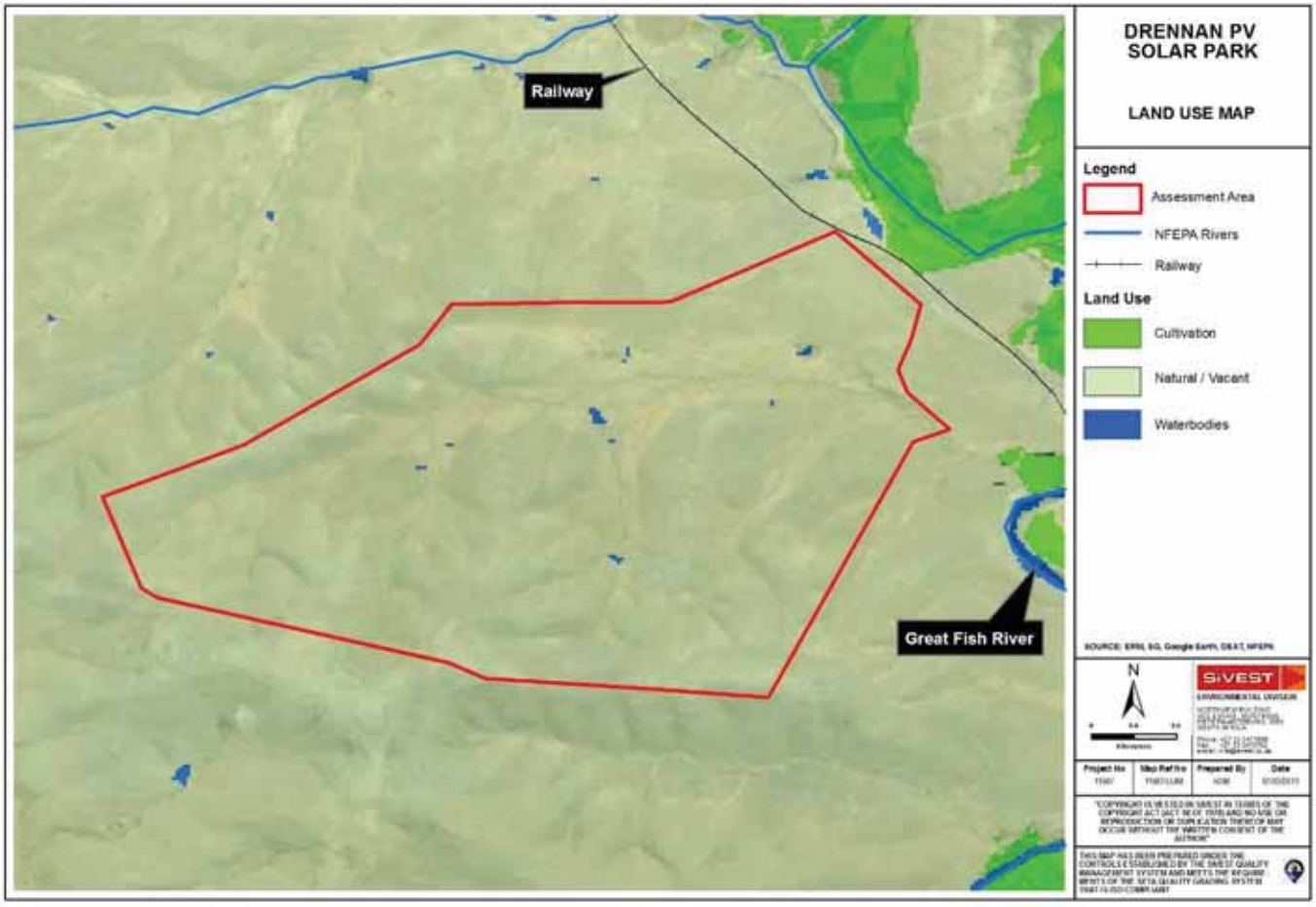

Figure 6: Land Cover Map

3.5 Soil Characteristics

According to the ENPAT database, the Drennan study area is underlain by two soil groups **(Figure 7**). The steeper slopes, in the southern and western portions of the site, are associated with shallow, rocky soils with an effective soil depth (depth to which roots can penetrate the soil) of less than 0.45 m, which is a limiting factor in terms of sustainable crop production.

The central portion and eastern area are dominated by Glenrosa and Mispah soil forms. These forms are also associated with shallow soils, where parent rock is found close to the land surface. These soils have an inherently low agricultural potential due to a prohibitive rooting depth and lower water holding capacity. These soil forms also exhibit moderately high soil erosion hazard ratings. The riparian zones to the east of the assessment area are associated with deeper soils and rich alluvial deposits. These areas are characterised by moderate soil depths of between 0.45 and 0.75 m (**Figure 8**).

The ENPAT Database also provides an overview of the study area's agricultural potential based on its soil characteristics, although it should be noted this spatial dataset does not take *prevailing climate into account*. According to the ENPAT agricultural dataset the study area is dominated by soils which are not suitable for arable agriculture but which can still be used as grazing land (**Figure 9**). Restrictive climate characteristics do, however, reduce the overall agricultural potential of the assessment area.

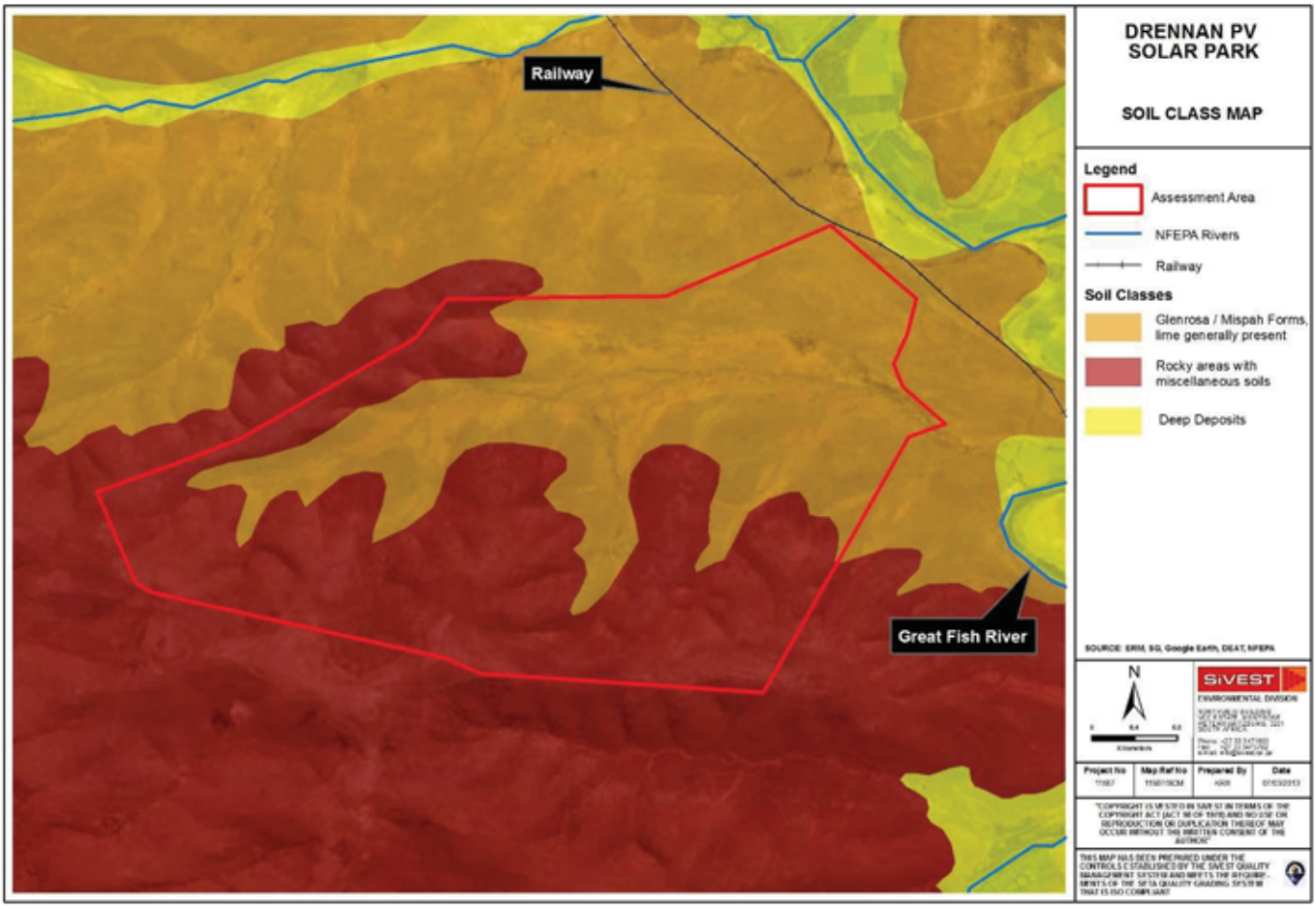

Figure 7: Broad soil type map

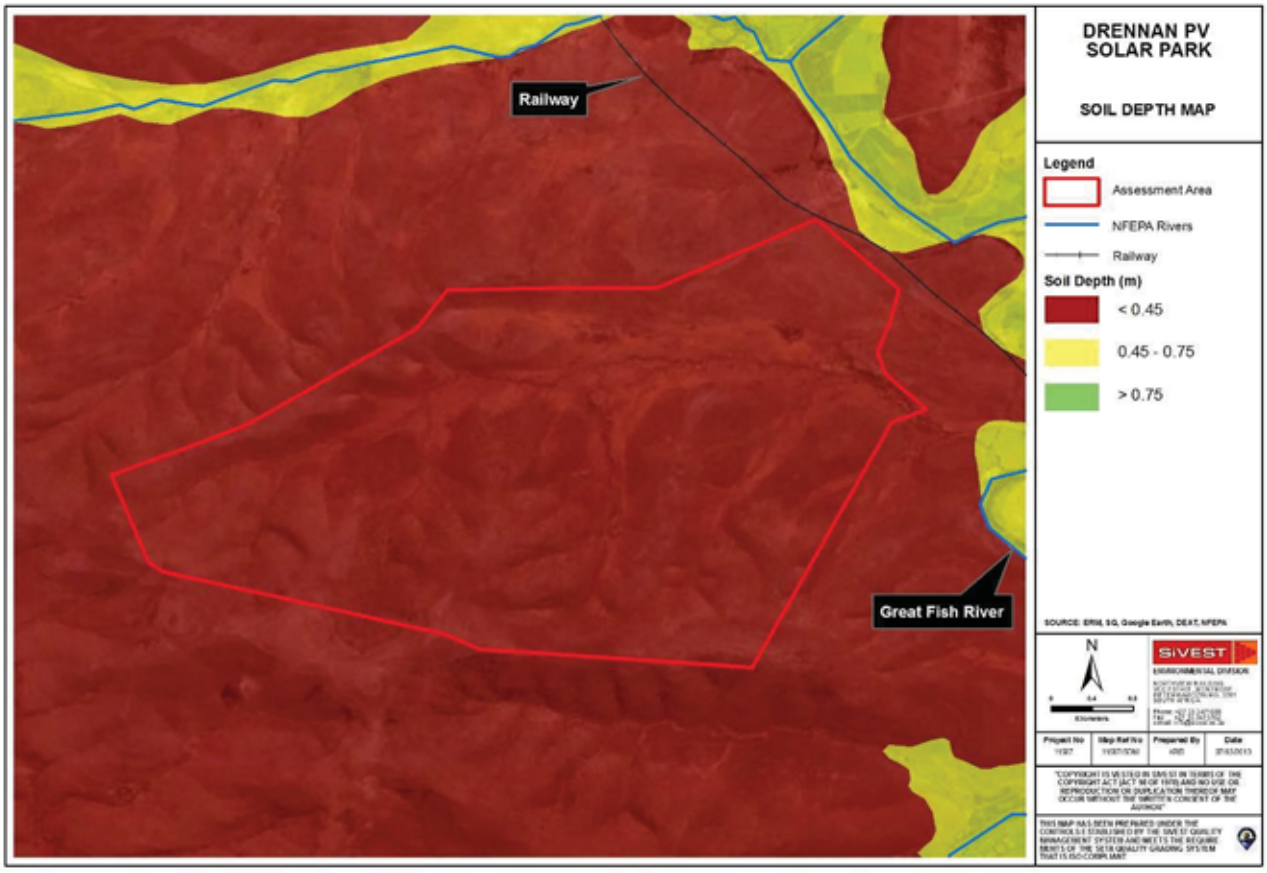

Figure 8: Soil depth map

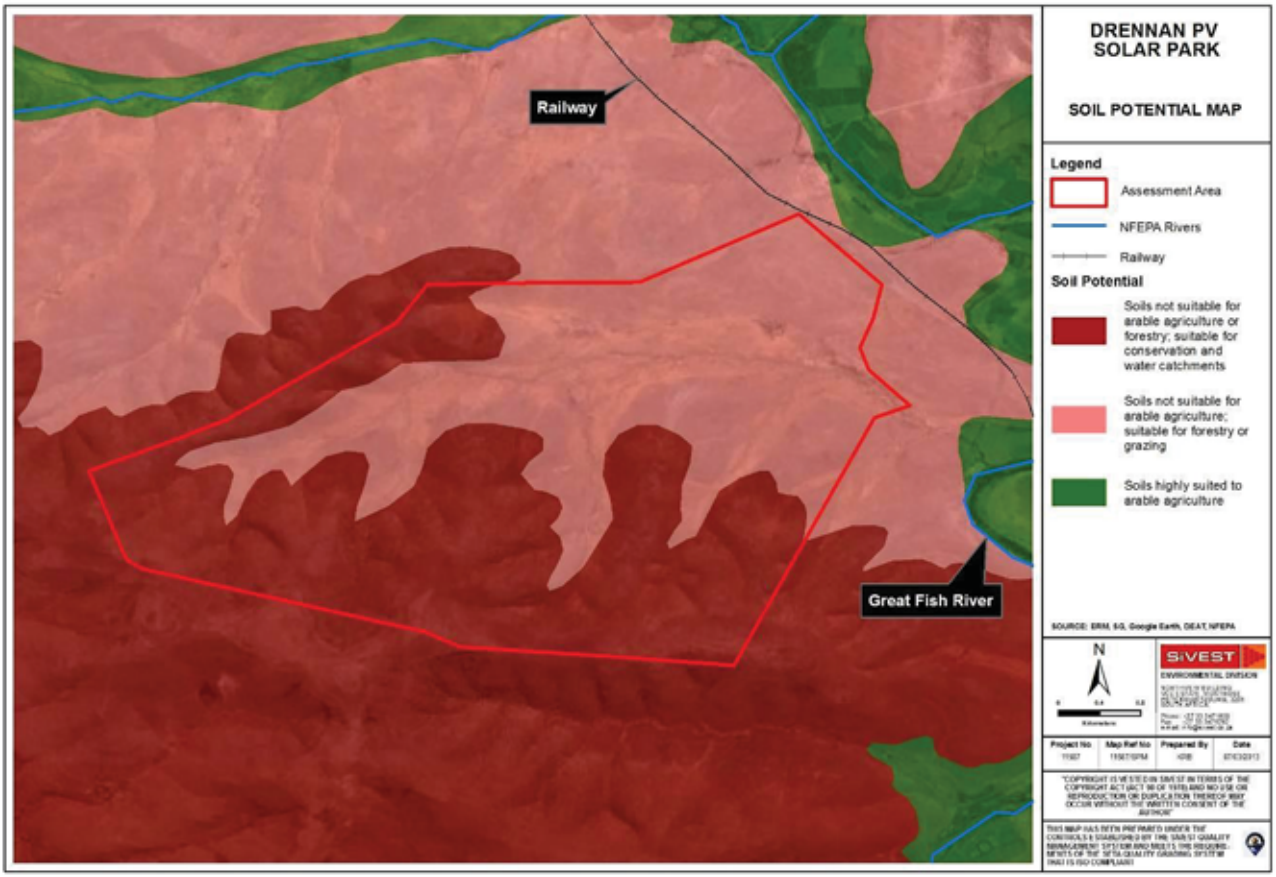

Figure 9: Soil Potential Map

3.6 Desktop Agricultural Assessment: Results Summary

Taking all the site characteristics (climate, geology, land use, slope and soils) into account, the agricultural potential for the majority of the study area is classified as being low for crop production whilst moderate for grazing. This poor agricultural potential rating is primarily due to restrictive climatic characteristics, steep slopes and soil depth limitations.

4. SOIL SURVEY AND FIELD VERIFICATION

A detailed soil survey was undertaken for the Drennan Site using a hand auger and GPS to record the location of each of the auger points. At each survey point the soil was described to form and family level according to "Soil Classification - A Taxonomic System for South Africa" (Soil Classification Working Group, 1991) and the following properties were noted:

- Estimation of 'A' horizon clay content,
- Permeability of upper B horizon,
- Soil Colour via the Munsell Soil Colour Charts
- Effective rooting depth,
- Signs of wetness,
- Surface rockiness,
- Surface crusting,
- Vegetation cover, and
- Detailed description of the particular area such as slope.

4.1 Soil Descriptions

This Section lists the major soil forms encountered during the soil survey along with a site-specific description of each soil form. Other soils encountered during the field verification, which were recorded sparsely across the site and therefore not fully described include:

- **Mayo** (Melanic A, Lithocutanic B)

4.1.1 Mispah Form

Soil Family: Mostly 1200 (Non bleached, Calcareous), limited bleach / non-calcareous
Diagnostic Horizons and Materials:
A-Horizon: Orthic
B-Horizon: Hard Rock

Site Specific Description:
The Mispah soil form falls within the lithic soil group. Lithic soils are associated with shallow soils where parent rock is found close to the soil surface. The A-horizon varied from bleached brown to dark brown in colour and was generally 10-20 cm deep, directly overlying hard rock materials. The Mispah soil form dominates the study area and surface rocks were also a common occurrence (**Figures 10** and **11**). Large portions of the site contain non-contiguous bands of shallow rock and Lithocutanic B horizons which lead to these areas being classified as a Mispah and Glenrosa complex.

Land Use Capability:
This soil has low agricultural potential due to the distinct lack of rooting depth and as such these soils are generally utilised for grazing land. If ripped and cultivated however precise irrigation scheduling is imperative. These soils can also exhibit high soil erosion hazard ratings thus soil conservation practices such as minimum tillage and trash blankets should be employed.

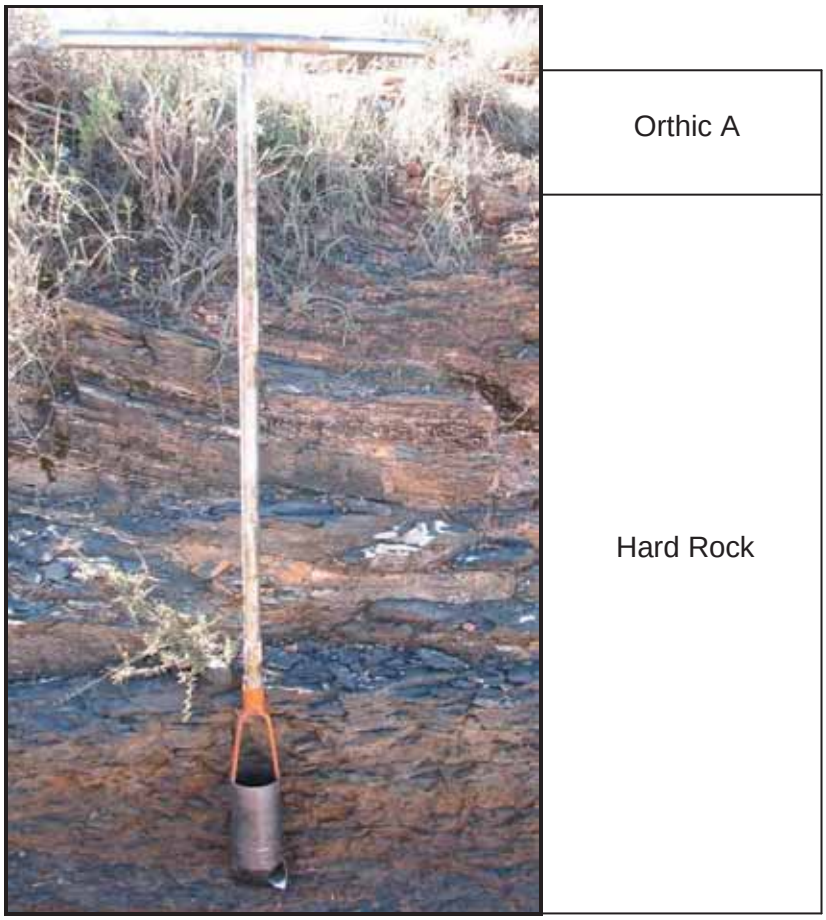

Figure 10: An example of a shallow Mispah Soil Form encountered on the Drennan Site

Figure 11: Shallow, rocky soils dominate large portions of the Drennan Site

4.1.2 Glenrosa Form

Family: 1111/1112/2211
Diagnostic Horizons and Materials:
A-Horizon: Orthic
B-Horizon: Lithocutanic

Site Specific Description:
Like the Mispah soil form, the Glenrosa form falls within the lithic soil group. This soil form is found throughout the surveyed area where bands of weathering rock are found close to the soil surface. In most cases the Orthic A is approximately 10-30 cm deep, depending on topographic position. The shallow Orthic A horizon overlies a Lithocutanic B-Horizon, which contains a high proportion of weathered rocks (**Figure 12**). The lower B-Horizon is generally limiting to plant roots but gaps between the weathering rock fragments can be opened by larger roots and thus the land use potential of this soil can be higher than expected. The Lithocutanic B merges into solid rock layers which are limiting to plant roots and generally found between 15 and 30 cm below the soil surface. Surface rocks were often evident where this soil form was found. Portions of the site contain non-contiguous bands of Lithocutanic B horizons and hard rock which lead to these areas being classified as a Mispah and Glenrosa complex.

Agricultural Potential:
Without careful management or preparation this soil has low agricultural potential as the effective soil depth is approximately 30 cm. Owing to this these soils are usually used as grazing land. If these soils are cultivated, careful irrigation scheduling would be essential. This soil form also exhibits high soil erosion hazard ratings; thus soil conservation practices such as minimum tillage and trash blankets should be employed.

Figure 12: An example of a Glenrosa Form

4.1.3 Coega Form

Family: 1000 (Calcareous A Horizon)
Diagnostic Horizons and Materials:
A-Horizon: Orthic
B-Horizon: Hardpan Carbonate

Site Specific Description:
The Coega form is a calcic soil whose profile contains at least one carbonate-rich horizon. Carbonate retention in the soil profile is a result of an arid climate where evaporation far exceeds rainfall. The Hardpan Carbonate horizon was often found on the surface. The effective soil depth was generally less than 0.2 m (**Figure 13**).

Agricultural Potential:
Calcic soils are associated with arid regions and thus the use of these carbonate rich soils in South Africa is limited. Limitations in terms of sustainable agricultural use include shallow rooting depth, high pH, high salinity and low plant Phosphorus availability (**Fey, 2010**). Such limitations restrict calcic soils to extensive grazing unless irrigation is available. These soils also exhibit high soil erosion hazard ratings thus soil conservation practices such as minimum tillage and trash blankets should be employed.

Figure 13: Surface hardpan carbonate on the Drennan Site

4.1.4 Swartland Form

Soil Family: 1121 (Mostly Non-Bleached A, Non-Calcareous B); Limited bleached and/or Calcarous
Diagnostic Horizons and Materials:
A-Horizon: Orthic
B-Horizon: Pedocutanic
C-Horizon: Saprolite

Site Specific Description:
The Swartland soil form falls within the duplex soil group whose defining characteristic is the enrichment of clay within the soil profile. Duplex soils are mostly found in the drier parts of South Africa and have in common the development of strong structure in the B-horizon and a marked increase in clay compared to the overlying horizon (**Fey, 2010**). The Orthic A Horizon was generally brown in colour and was moderately structured. This Orthic A horizon overlies a well-structured B-Horizon, which contains a high proportion of clay due to illuviation. The B-Horizon has a cutanic character with medium course texture (**Figure 14**). This soil can be classified as duplex in nature and in certain instances the B-Horizon was considered an impediment to root growth and water movement. The pedocutanic merged into weathering rock.

Agricultural Potential:
Duplex soils occur widely in South Africa and present a variety of management factors to farmers and engineers. This soil form, in the context of this assessment, has a low agricultural potential owing to the well-structured Pedocutanic B, shallow effective soil depth and duplex character of the B-horizon, which curtails root growth and water movement. The effective depth of this soil was often less than 0.3 m. This soil form also exhibits high soil erosion hazard ratings. The main cause of erosion is clay dispersion, which gives rise to surface sealing and intensifies surface runoff. If cultivated the chemical properties of duplex soils will most likely also need attention. This could include sodicity and salinity correction.

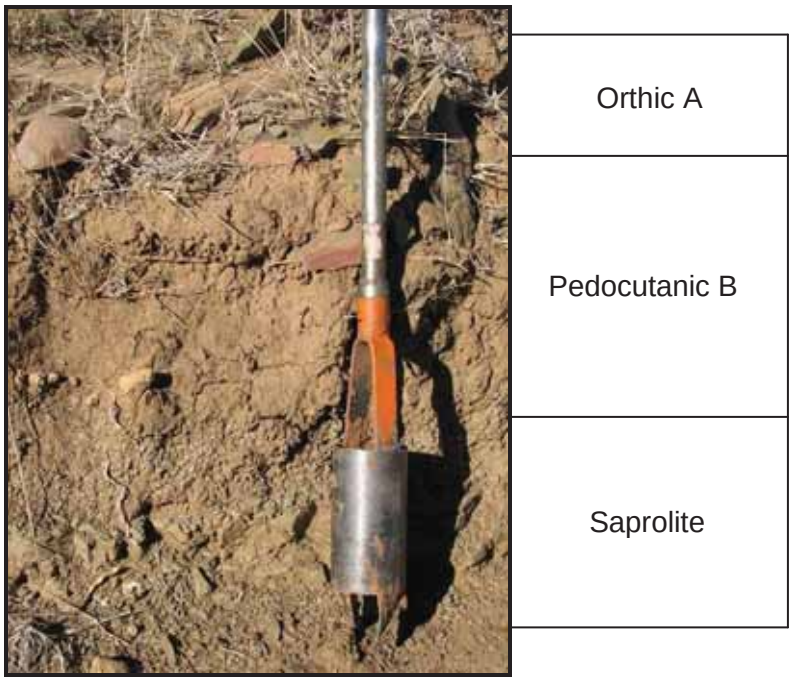

Figure 14: An example of a typical Swartland form encountered on the site

4.2 Soil Summary

The soils identified on the PDA are shallow with a low agricultural potential. Rocky and duplex soils (Mispah, Glenrosa Swartland Forms) cover 98% of the surveyed area (**Figures 15** and **16**). All the soils encountered on site contained at least one layer that was limiting to plant growth and these layers included Lithocutanic, saprolite, hard rock and hard pan carbonate.

The location and description of the sample points are provided in **Appendix A: Soil Properties**. This information was used to create a verified soil map showing homogeneous soil bodies (**Figure 15**). Combining the effective depth information (i.e. depth to root limiting layer) and Inverse Distance Weighting one is able to obtain a generalised soil depth for the Drennan Site (**Figure 17**). Soils with an effective depth of greater than 30 cm were rarely observed during the soil survey, with most soils exhibiting an effective soil depth of less than 20 cm.

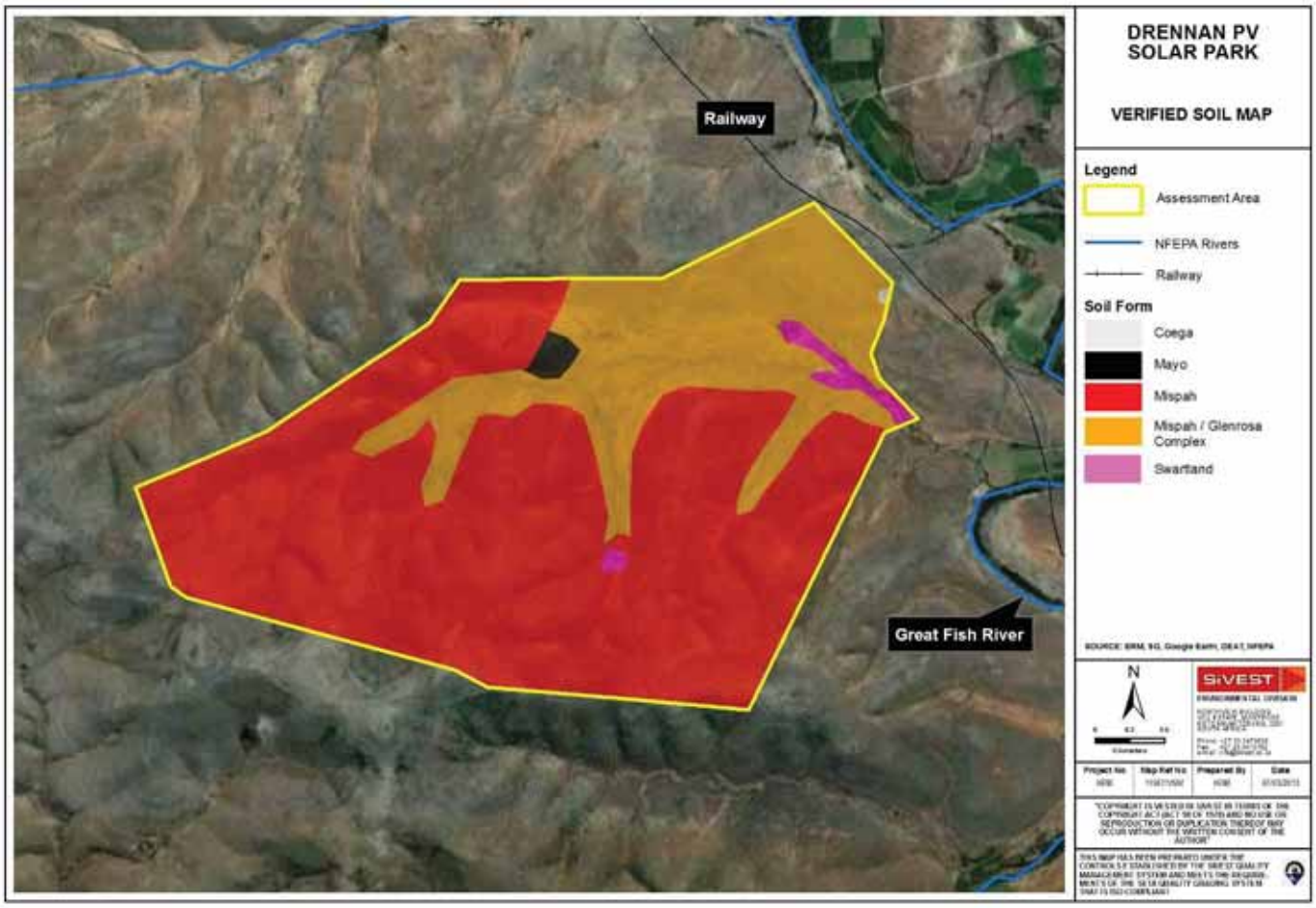

Figure 15: Verified Soil Map for the Drennan site

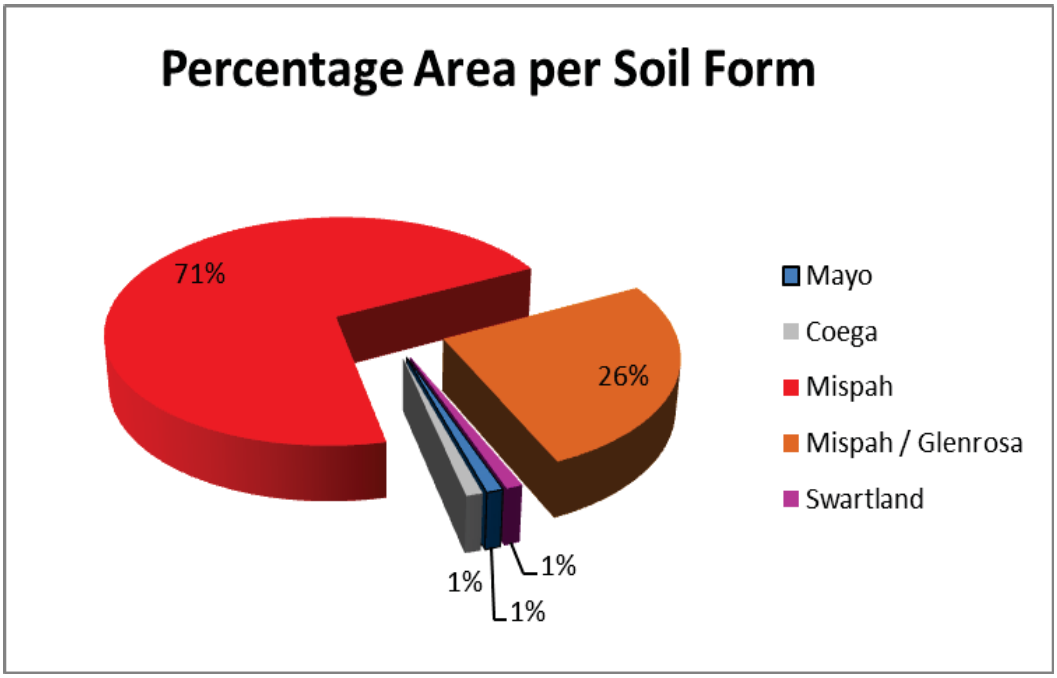

Figure 16: Graph showing the percentage area per soil form / complex

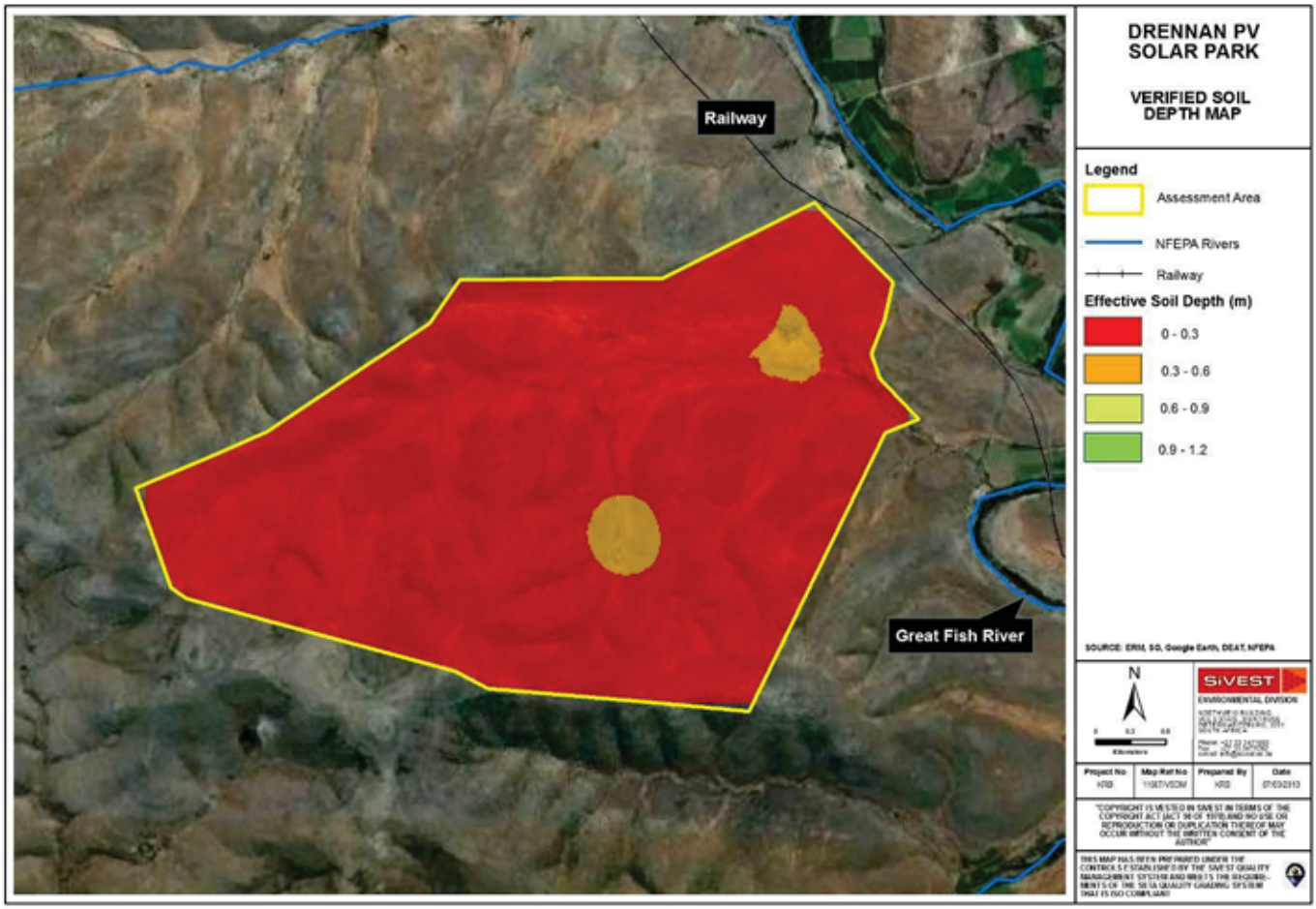

Figure 17: Verified Soil Depth Map

5. AGRICULTURAL POTENTIAL ASSESSMENT

In terms of this study, agricultural potential is described as an area's suitability and capacity to sustainably accommodate an agricultural land use with this potential being benchmarked against crop production.

5.1 Current Situation

The Drennan Site is dominated by unimproved grassland and scattered trees. The influenced farm portions are currently used as extensive grazing land for free range sheep and beef production (**Figure 18**). Stocking rates are estimated at around 1 SSM (small stock unit) per 3 hectares and 1 LSU (large stock unit) per 15 hectares. Around 70% of the assessment area is dominated by steeper slopes and rocky outcrops (**Figure 19**). These areas are limiting to arable agriculture and due to the steep topography and associated engineering constraints these areas are excluded from the preliminary development layouts. The remaining 30% of the area consists of gently sloping grazing land, interspersed with episodic stream beds and excavated stock watering impoundments.

Other than topography, water is the major limiting factor to local agricultural enterprises. The farm portions, which constitute the study area, are located away from the more fertile flood plain of the Great Fish River. These portions do not have abstraction or water rights. Furthermore the assessment area does not accommodate any centre pivots, irrigation schemes or active agricultural fields.

Figure 18: A flock of sheep grazing on the Drennan Site

Figure 19: Steeper slopes (background) dominate large areas of the study area

5.2 Verified Agricultural Potential

Overall agricultural potential of the site is based on assessing a number of inter-related factors including climate, topography, soil type, soil limitations and current land use. Climate, shallow soils and topography are the major limiting factors for agricultural potential. The combination of low, seasonal rainfall and a severe moisture deficit infer that sustainable arable agriculture cannot take place without some form of irrigation. The study area is approximately 650 m from the Great Fish River, a reliable irrigation resource. However, the impacted farm portions have no water rights to this resource. Even if irrigation water could be secured it is not agriculturally or economically feasible to irrigate these farm portions. Due the high abstraction demand on the Great Fish the successful procurement of such water use licences is also in doubt.

Of the assessment area, around 70% of it is dominated by steeper slopes and rocky outcrops. Away from these rocky areas the land is generally flat with an average gradient of less than 10%, these flatter areas are associated with a higher potential for grazing. The flat topography makes this eastern area ideal for the proposed development, as minimal earthworks will be required to prepare the site.

Rocky and duplex soils (Mispah, Glenrosa Swartland Forms) cover 98% of the surveyed area. All the soils encountered on site contained at least one layer that was limiting to plant growth and these layers included Lithocutanic, saprolite, hard rock and hard pan carbonate. Effective soil depth rarely exceeded 30 cm. A map indicating the agricultural potential in terms of **crop production** for the Drennan Site is provided in **Figure 20**. The majority of the assessment area is classified as having very low potential for crop production, which is attributed to a restrictive climate, steep slopes and highly limiting soil characteristics. The less undulating eastern portions are associated with a slightly

higher agricultural potential. The Drennan Site Farm is not classified as having a high agricultural potential and is also not a unique dry land agricultural resource. The study area is considered to have a moderate to moderately low value when utilised as grazing land, its current use.

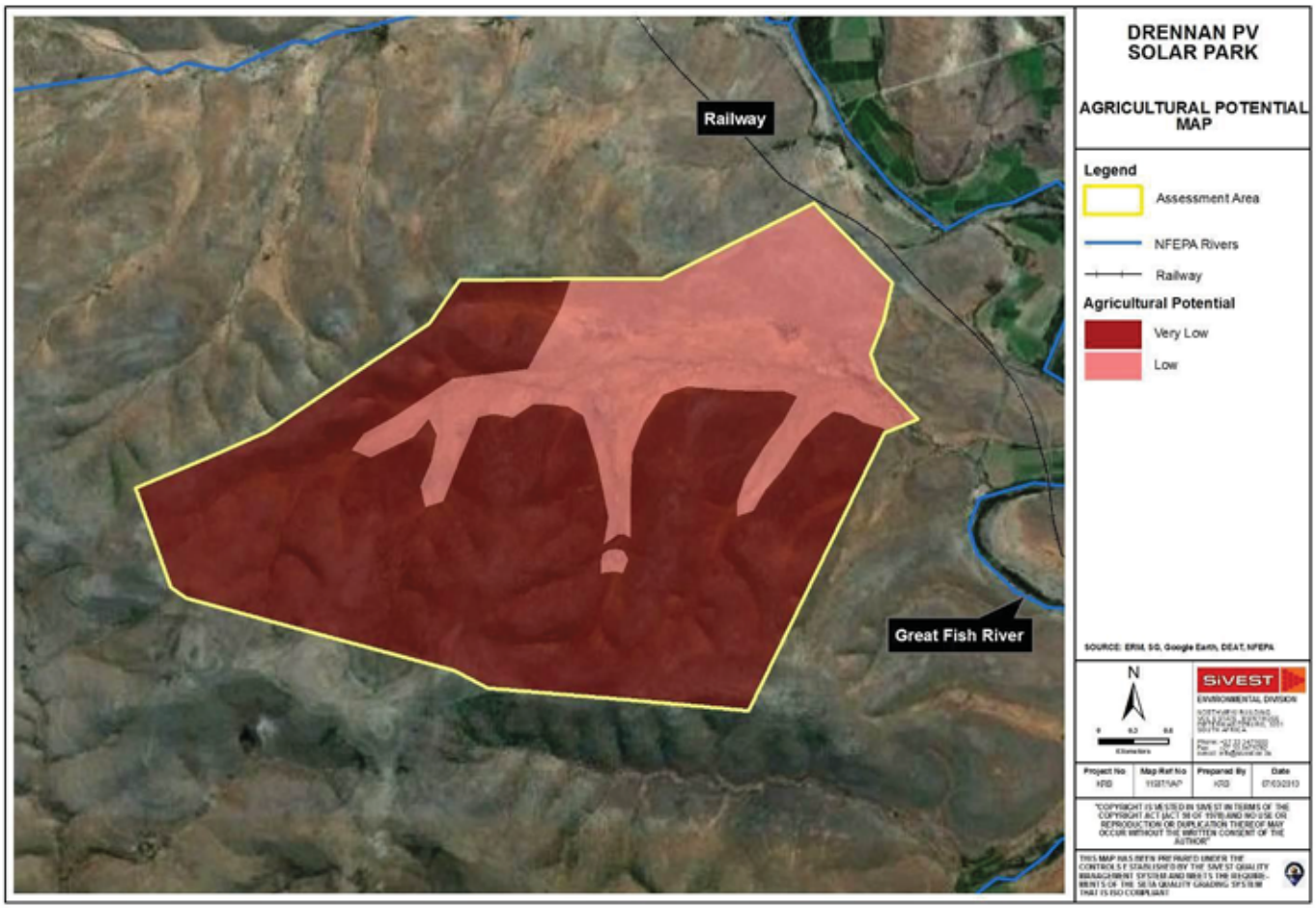

Figure 20: Agricultural Potential Map for the Drennan Site

6. AGRICULTURAL IMPACT ASSESSMENT

From an agricultural perspective the loss of high value farm land and / or food security production, as a result of the proposed activities, is the primary concern of this assessment. In South Africa there is a scarcity of high potential agricultural land, with less than 14% of the total area being suitable for dry land crop production (**Smith, 2006**). Consequently areas which can sustainably accommodate dry land production need to be protected from non-agricultural land uses. The desktop assessment, field verification and agricultural potential assessment (**Sections 3, 4 and 5**) has already shown that the Drennan Site is unsuitable for sustainable crop production and is dominated by unimproved grazing land.

The proposed development's primary impact on agricultural activities will involve the construction of the solar fields and associated infrastructure. This will entail the initial clearing of vegetation and levelling of the site. Unless grazing is permitted within the PV site, the proposed solar development will effectively eliminate the lands agricultural potential, for as long as the development persists (worst case scenario). The construction of the 90 MW solar field and associated infrastructure will only

influence a small portion of the total farm area (approximately 110 ha). The remaining land will continue to function as it did prior to the development (approximately 1673 ha or 94%).

The results of this assessment indicate that the Drennan site has low agricultural and is replaceable when assessed within the context of the proposed development. Consequently, the overall impact of the Solar Energy Facility on the study area's agricultural potential and production will be low, due to the site's low inherent agricultural potential and value. There are no centre pivots, irrigation schemes or active agricultural fields which will be influenced by the proposed development, and as such there are no problematic or fatal flaw areas for the Drennan Site.

The proposed linking power lines, from the PV arrays to the Eskom overhead transmission lines, will be facilitated by a new 'loop-in' 'loop-out' substation and additional transmission lines of around 22m in length (the construction of additional transmission line towers is not required). Owing to this, the new grid connection infrastructure will have an insignificant impact on agricultural production.

The proposed development is not expected to have any cumulative impact due to minor loss of agricultural land and production potential.

6.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include the context and the intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global) whereas Intensity is defined by the severity of the impact (e.g. the magnitude of deviation from background or baseline conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence). Significance is calculated as per the example shown in **Table 3**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

6.2 Impact Rating System Methodology

Impact assessments must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental).

6.2.1 Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation for the identified impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		

1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.**

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

6.2.2 Impact Summary

Once rated, the impacts are summarised and a comparison made between pre- and post-mitigation phases. The rating of environmental issues associated with different parameters prior to and post mitigation of a proposed activity will be averaged. A comparison is then made to determine the effectiveness of the proposed mitigation measures and identify critical issues related to the environmental parameters. Please note pre-mitigation is taken as a worst case scenario i.e. no

grazing is permitted within the PV site and thus effectively eliminating the lands agricultural potential / production, for as long as the development persists.

Table 1: Pre-mitigation impact rating table for the loss of agricultural land and/or production

IMPACT TABLE (Drennan)	
Environmental Parameter	***Soil and Land Use Resources***
Issue/Impact/Environmental Effect/Nature	***Loss of agricultural land and / or production as a result of the proposed activities***
Extent	***Site****: Impacts will be restricted to the site.*
Probability	***Definite****: Loss of grazing land will definitely occur.*
Reversibility	***Completely Reversible****: The land can be returned to grazing after the project has been decommissioned.*
Irreplaceable loss of resources	***Marginal Loss****: The construction of the solar PV field and associated infrastructure will result in a very marginal loss of agricultural land, production and viability.*
Duration	***Long Term****: The impact and its effects will continue or last for the entire operational life of the development. The life span of the development is greater than 20 years*.
Cumulative effect	**Negligible Cumulative Impact**
Intensity/magnitude	***Low:*** Impact affects the quality, use and integrity of the agricultural value / production in a way that is barely perceptible.
Significance Rating	The anticipated impact will have negligible negative effects and will require little to no mitigation.

Table 2: Post-mitigation impact rating table for the loss of agricultural land and/or production

IMPACT TABLE (Drennan)	
Environmental Parameter	***Soil and Land Use Resources***
Issue/Impact/Environmental Effect/Nature	***Loss of agricultural land and / or production as a result of the proposed activities***
Extent	***Site****: Impacts will be restricted to the site.*
Probability	***Unlikely****: If seasonal sheep grazing is accepted as a mitigation measure then the chance of the losing significant agricultural resources is low.*
Reversibility	***Completely Reversible****: The land can be returned to grazing after the project has been decommissioned.*
Irreplaceable loss of resources	***No Loss****: If periodic grazing is approved, as a viable mitigation measure, no irreplaceable agricultural resources will be lost*.
Duration	***Long Term****: The impact and its effects will continue or last for the entire operational life of the development. The life span of the development is greater than 20 years*.
Cumulative effect	**Negligible Cumulative Impact**
Intensity/magnitude	***Low:*** Impact affects the quality, use and integrity of the agricultural value / production in a way that is barely perceptible.
Significance Rating	The anticipated impact will have negligible negative effects and will require little to no mitigation.

Table 3: Pre- and Post-Mitigation impact ratings and proposed mitigation measures

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-12 (**low negative**)	-8 (**low negative**)
Mitigation measures	▪ Allow periodic grazing within the PV fields (sheep and wildlife). This mitigation will minimise the loss of grazing land and allow agricultural production to remain virtually unaffected. ▪ Due to the overarching site characteristics and the nature of the proposed development viable mitigation measures are limited and will most likely revolve around erosion control: ➢ Clearing activities should be kept to a minimum (panel and road footprint). ➢ In the unlikely event that heavy rains are expected activities should be put on hold to reduce the risk of erosion. ➢ If additional earthworks are required, any steep or large embankments that are expected to be exposed during the 'rainy' months should either be armoured with fascine like structures (unlikely scenario). ▪ If earth works are required then storm water control and wind screening should be undertaken to prevent soil loss from the site	

It is clear that even without mitigation measures the proposed activities will have a very low impact on current agricultural production, soil resources, agricultural potential and overall farm viability. From an agricultural perspective the entire assessment area is suitable for the proposed development (**Figure 21**). **Figure 21** also indicates the proposed positioning of the PV field, which is agreeable from an agricultural perspective.

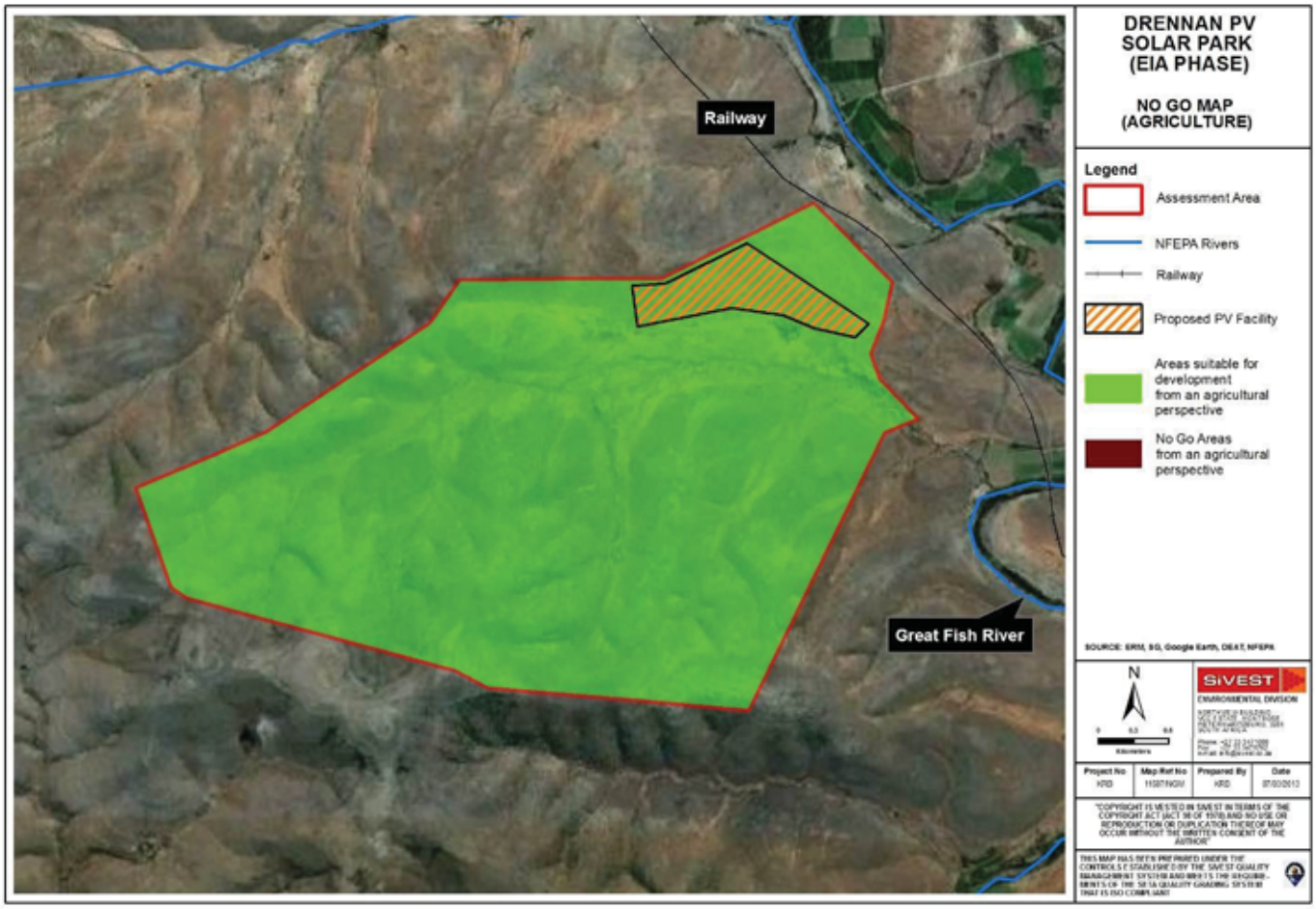

Figure 21: Verified No Go Area Map from an agricultural perspective

7 EROSION MANAGEMENT PLAN

Soil is a natural resource, non-renewable in the short term and is expensive either to reclaim or improve following degradation (**van Lynden & Oldeman, 1997**).

Even though the areas directly affected by the proposed development have low agricultural value and capability, the activities still have the potential to have negative implications on the immediate and surrounding soil and land resources. The ***International Soil Reference and Information Centre* (ISRIC)**, the producers of the World Map of Human-Induced Soil Degradation, recognises two categories of human-induced soil degradation processes.

The **first category** deals with soil degradation by displacement of soil material mainly through water and wind erosion. Soil erosion causes land degradation through a reduction in agricultural potential in many parts of South Africa. The major issues surrounding soil erosion are the loss of the top soil layer required for plant growth, reduction of soil nutrients, siltation of aquatic systems as well as the general land and ecosystem degradation.

The **second category** of soil degradation deals with in-situ soil physical and chemical and biological deterioration. In-situ soil degradation due to anthropogenic activities can be divided into various classes and subclasses:

- **Physical Degradation** (waterlogging, compaction, crusting, pore modification, etc.)
- **Chemical Degradation** (eutrophication, acidification, salinisation, heavy metal pollution, etc.)
- **Biological Degradation** (pathogen introduction, modification of microbial activity etc.)

A single or combination of the aforementioned degradations leads to a decrease in soil quality/health which in turn influences land capability ratings (**ISRIC, 1990**). Due to the proposed activities this management plan focuses primarily on soil erosion however generic soil contamination mitigations are provided in **Section 8.3**.

7.1 Soil Erosion Monitoring

Due to the size of the site and without rigorous scientific methods and equipment, soil erosion will need to be monitored visually by the appointed Environmental Control Officer (ECO)[1]. Soil erosion is a natural process, whose rate and intensity can anthropogenically increased. Excessive erosion can lead to land degradation and in the reduction of the area's carrying capacity. It is recommended that areas around PV field are visually monitored during audits. A photographic record of the on-site conditions will also aid in the identification of erosion problems. Signs of rill and gully erosion should be remediated as soon as possible. Typical remediation techniques are provided in **Section 8.2**, below.

7.2 Proposed Soil Erosion Mitigatory Measures

Clearing activities should be kept to a minimum and must only be undertaken during agreed working times as well as permitted weather conditions. If heavy rains are expected clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. The further unnecessary removal of groundcover vegetation from slopes must be prevented, especially on steep slopes.

Following the clearing of an area, the surfaces of all exposed slopes must be roughened to retain water and increase infiltration (especially important during the wet season). Any steep or large embankments that are expected to be exposed during the 'rainy' months should either be armoured with fascine like structures or vegetated. A fascine structure usually consists of a natural wood material and is used for the strengthening of earthen structures or embankments. If a cleared area is not going to be built on immediately, the top layer (nominally 150 mm) of soil should be removed and stockpiled in a designated area approved by the ECO. Vegetation shall be stripped in a sequential manner as the work proceeds so as to reduce the time that stripped areas are exposed to the elements. Top-soiling and re-vegetation shall start immediately after the completion of an activity and at an agreed distance behind any particular work front. It is highly recommended that existing farm roads are used as much as possible, while the additional creation of access roads should be kept to a

[1] The person appointed will provide direction to the Contractor concerning the activities within the Construction Zone, and who will be responsible for conducting the Environmental Audit of the project during the construction and operational phases of the project.

minimum. Where roads need to be created, a dual tyre track road should be used rather than clearing the entire road width.

Storm water control and wind screening should be undertaken to prevent soil loss from the site. All embankments shall be protected by a cut off drain to prevent water from running down the face of the embankment and resulting in erosion. Typical erosion control measures such as the installation of silt fences, hay bales, EcoLogs™ and Bio Jute™ are recommended if erosion problems are noted during construction and operation phases (**Figure 22**).

Figure 22: Typical soil erosion mitigatory measure: BioJute Installation (**top left**); a silt fence protecting a stockpile (**top right**) and pegged hay bale wall used to reduce runoff velocities (**bottom**)

7.3 Proposed Groundwater and Soil Contamination Mitigatory Measures

Every precaution must be taken to ensure that any chemicals or hazardous substances do not contaminate the soil or groundwater on site.
For this purpose the Contractor must:

- Ensure that the mixing /decanting of all chemicals and hazardous materials should take place on a tray or impermeable surface.
- Waste generated from these should then be disposed of at a registered landfill site.
- Ensure all storage tanks are designed and managed in order to prevent pollution of drains, groundwater and soils.
- Construct separate storm water collection areas and interceptors at storage tanks, and other associated potential pollution activities.
- Ensure that use and storage of fuels and chemicals that could potentially leach into the ground be controlled. Adequate spillage containment measures shall be implemented, such as cut off

drains, etc. Fuel and chemical storage containers shall be set on a concrete plinth. The containment capacity shall be equal to the full amount of material stored, plus 10%.

- Appoint appropriate contractors to remove any residue from spillages from site. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the above-mentioned Regulations and Acts.
- Ensure that used oils/lubricants are not disposed of on/near the site, and that contractors purchasing these materials understand the liability under which they must operate. The ECO will be responsible for reporting the storage/use of any other potentially harmful materials to the relevant authority.
- Ensure that potentially harmful materials are properly stored in a dry, secure environment, with concrete or sealed flooring. The ECO will ensure that materials storage facilities are cleaned/maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no spillage onto the bare soil or surface water. The management of such storage facilities and means of securing them shall be agreed.
- Site staff shall not be permitted to use any stream, river, other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any other construction or related activities. Municipal water or another source approved by the ECO should rather be used for all activities such as washing of equipment, dust suppression, concrete mixing and compacting.

7.4 Stockpile Management

General requirements for stockpiles are that they should be situated in an area that should not obstruct the natural water pathways on site. Topsoil stockpiles will be kept separate from other stockpiles, shall not be compacted, and shall not exceed 2m in height. If they are exposed to windy conditions or heavy rain, they could either be protected by re-vegetation using an indigenous grass seed mix or cloth, depending on the duration of the project. The construction of a berm consisting of sand bags or a low brick wall can be placed around the base of the stockpile for retention purposes. The stockpile should be maintained by regular weeding, keeping it free of alien vegetation and weeds. Stockpiles shall be kept free of any contaminants whatsoever, including paints, building rubble, cement, chemicals, oil, etc.

Subsoil and topsoil stockpiles will be moved to areas of final utilisation as soon as possible to avoid unnecessary erosion. Stockpiles not utilized within three months of the initial stripping process (or prior to the onset of seasonal rains) will be seeded with appropriate grass seed mixes, including indigenous grasses normally found in coastal grasslands or brush-packed to further avoid possible erosion.

7.5 Land Rehabilitation

All rubble is to be removed from the site to an approved landfill site as per construction phase requirements. No remaining rubble is to be buried on site. The site is to be free of litter and surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared.

8 SUMMARY AND RECOMMENDATIONS

Environmental Resources Management (ERM) on behalf of **Solaire Direct** requested a baseline assessment of the soil, land use and agricultural characteristics for the area affected by the proposed Drennan Solar Energy Facility, in the Eastern Cape Province of South Africa. The primary objective of this assessment is to provide specialist soil and agricultural input into the overarching EIA Report. Solaire Direct proposes to construct a 90 Mega Watt Photovoltaic (PV) solar power facility and associated infrastructure within Portions 15 and 16 (of Portion 1) of the Farm Waai Plaats (No. 550) which constitutes approximately 1783 ha. The proposed 90 Mega Watt facility has an estimated developmental footprint of 110 ha. The power generated by the project would be transmitted to the national grid via Eskom's existing Drennan Traction Line Substation.

The study area has a continental climate with a late summer rainfall regime i.e. most of the rainfall is confined to summer and autumn. MAP is approximately 379 mm per year. The climate for the study area is moderately to highly restrictive to dry land arable agriculture. This is primarily attributed to low, seasonal rainfall, a large moisture deficit and frost hazard. This combination means that sustainable arable agriculture cannot take place on the farm without some form of irrigation. The assessment area is approximately 650 m from the Great Fish River, a reliable irrigation resource. However, the impacted farm portions have no water rights to this resource. Even if irrigation water could be secured it is not agriculturally and economically feasible to irrigate these farm portions.

Of the study area, around 70% of it is dominated by steeper slopes and rocky outcrops. These areas are limiting to arable agriculture and due to the extreme topography and associated engineering constraints these areas are excluded from the preliminary development layouts. The remaining 30% of the area consists of gently sloping grazing land, interspersed with episodic stream beds and excavated stock watering impoundments.

The soils identified on the Drennan Site are shallow with a low agricultural potential. Rocky and duplex soils (Mispah, Glenrosa Swartland Forms) cover 98% of the surveyed area. All the soils encountered on site contained at least one layer that was limiting to plant growth and these layers included Lithocutanic, saprolite, hard rock and hard pan carbonate. Soils with an effective depth of greater than 30 cm were rarely observed during the soil survey, with most soils exhibiting an effective soil depth of less than 20 cm.

The majority of the study area is classified as having very low potential for crop production, which is attributed to a restrictive climate, steep slopes and highly limiting soil characteristics. The less undulating eastern portions are associated with a slightly higher agricultural potential. The Drennan Site is not classified as having a high agricultural potential and is also not a unique dry land agricultural resource. The study area is considered to have a moderate to moderately low value when utilised as grazing land, its current use.

The proposed development's primary impact on agricultural activities will involve the construction of the solar fields and associated infrastructure. The predicted post-mitigation impact rating on agricultural potential and production is *low negative*. The construction of the 90 MW solar field and associated infrastructure will only influence a small portion of the total farm area (approximately 110

ha). The remaining land will continue to function as it did prior to the development (approximately 1673ha or 94%).The proposed development is not expected to have any cumulative impacts and will cause minimal disruptions to general farm management.

There are no centre pivots, irrigation schemes or active agricultural fields which will be influenced by the current development layout. There are no fatal flaw areas for the Drennan Site, based on the agricultural potential assessment, as a standalone specialist study.

In order to further mitigate the potential impact it is highly recommended that periodic grazing of sheep within the PV fields is allowed. This mitigation will minimise the loss of grazing land and allow agricultural production to remain virtually unchanged and unaffected.

From an agricultural perspective if the suggested mitigation measures and erosion management plan are correctly implemented there is no reason why the proposed solar energy facilities cannot be accommodated on the within the Drennan Site.

9. REFERENCES

AGIS Database 2012. Source: *http://www.agis.agric.za/agisweb/agis.html*

Brady, N.C., and Weil, R.R. 2004. Elements of The Nature and Properties of Soils, 2nd edn. Upper Saddle, NJ: Prentice-Hall.

Department of Environmental Affairs and Tourism. 2001. *Environmental Potential Atlas for South Africa.*

ERM. 2012. Drennan Draft Scoping Report.

Fey, M. (2010). Soils of South Africa. Cambridge University Press.

FAO. (2007) Mapping biophysical factors that influence agricultural production and rural vulnerability. Source: *www.fao.org/docrep/010/a1075e/a1075e00.HTM*

Mucina, L. and Rutherford, M.C.(eds). 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

SA Explorer. Source: *http://www.saexplorer.co.za*

SA Rainfall Atlas. Source: *http://134.76.173.220/rainfall/index.html*

Smith, B. 2006. The Farming Handbook. University of KwaZulu-Natal Press.

Soil Classification Working Group. 1991. Soil Classification: a taxonomic system for South Africa. ARC-Institute for Soil, Climate and Water, Pretoria.

Van Lyden, G.W.J. and Oldeman, L.R.(1997) The Assessment of the Status of Human-Induced Soil Degradation in South and Southeast Asia. International Soil Reference and Information Centre.

World map of the status of human-induced soil degradation: an explanatory note. (1990) Oldeman, L.R., Hakkeling, R.T.A, and Sombroek, W.G. International Soil Reference and Information Centre; Nairobi: United Nations Environment Programme. -I11.

APPENDIX A: SOIL PROPERTIES

Auger Number	Soil Form	Soil Family	Effective Depth (m)	Limiting Layer	X	Y
1	Gs	1112	0.30	Rock	69960.691	-3591385.738
2	Ms	1200	0.10	Rock	69750.480	-3591808.911
3	Gs	1112	0.20	Rock	68878.639	-3591689.260
4	Gs	1112	0.30	Rock	68412.544	-3591668.560
5	Ms	1200	0.10	Rock	68148.297	-3591712.787
6	Ms	1200	0.20	Rock	69839.020	-3591229.845
7	Gs	1112	0.30	Rock	69612.843	-3591051.263
8	Ms	1200	0.10	Rock	69313.419	-3590757.052
9	Ms	1100	0.30	Rock	69202.317	-3592023.180
10	My	2100	0.20	Rock	67011.838	-3592113.029
11	My	2100	0.20	Rock	67088.292	-3591890.189
12	Gs	2200	0.20	Rcok	67158.596	-3591750.617
13	Ms	1100	0.10	Rock	67271.618	-3591508.316
14	Ms	1100	0.10	Rock	67480.200	-3591319.700
15	Gs	1111	0.20	Rock	67735.317	-3591315.180
16	Ms	1100	0.10	Rock	67981.720	-3591331.207
17	Ms	1100	0.10	Rock	68162.318	-3591242.782
18	Ms	1100	0.10	Rock	68256.892	-3591287.059
19	Gs	1111	0.30	Rock	68387.824	-3591346.895
20	Gs	1111	0.20	Rock	68467.041	-3591370.414
21	Ms	1100	0.10	Rock	68660.971	-3591486.254
22	Gs	1111	0.20	Rock	69338.733	-3591698.859
23	Gs	1111	0.20	Rock	69358.963	-3591568.178
24	Gs	1111	0.30	Rock	69397.982	-3591417.436
25	Ms	1100	0.10	Rock	69411.625	-3591259.102
26	Ms	1100	0.10	Rock	69221.490	-3591246.216
27	Ms	1100	0.20	Rock	69117.304	-3591237.216
28	Ms	1100	0.20	Rock	69036.149	-3591186.116
29	Gs	1111	0.20	Rock	68781.466	-3591006.837
30	Gs	1111	0.20	Rock	68712.823	-3590964.034
31	Gs	1111	0.30	Rock	68574.929	-3591036.723
32	Gs	1111	0.20	Rock	68499.606	-3591076.572
33	Gs	1111	0.20	Rock	68553.534	-3591218.283
34	Gs	1111	0.30	Rock	68748.977	-3591382.835
35	Sw	1121	0.60	Sap	69117.612	-3591789.168
36	Cg	1000	0.10	HPC	69961.863	-3591448.279
37	Cg	1000	0.10	HPC	69252.247	-3590606.139
38	Ms	1100	0.20	Rock	69071.155	-3590419.394
39	Gs	1111	0.30	Rock	68828.530	-3590200.904
40	Ms	1100	0.10	Rock	68581.040	-3589939.458

Auger Number	Soil Form	Soil Family	Effective Depth (m)	Limiting Layer	X	Y
41	Ms	1100	0.10	Rock	68197.855	-3589556.252
42	Gs	1111	0.30	Rock	67631.624	-3588826.359
43	Ms	1100	0.10	Rock	67186.396	-3588235.165
44	Ms	1100	0.10	Rock	67093.695	-3588088.259
45	Sw	1121	0.40	Sap	67343.578	-3588435.862
46	Sw	1121	0.40	Sap	65787.251	-3589788.312
47	Ms	2100	0.10	Rock	66079.070	-3589846.355
48	Ms	2100	0.10	Rock	66282.344	-3589902.353
49	Ms	1100	0.10	Rock	66455.157	-3589961.305
50	Gs	1111	0.30	Rock	66663.748	-3589992.294
51	Gs	1111	0.20	Rock	66892.718	-3590033.760
52	Gs	2212	0.30	Rock	67137.879	-3590094.079
53	Sw	1121	0.50	Sap	67373.592	-3590205.087
54	Gs	2212	0.30	Rock	67452.088	-3590203.708
55	Gs	2212	0.30	Rock	67658.173	-3590267.478
56	Ms	1100	0.10	Rock	67840.226	-3590312.573
57	Gs	2211	0.30	Rock	67964.023	-3590454.102
58	Ms	1100	0.10	Rock	68089.844	-3590547.633
59	Gs	2211	0.30	Rock	68232.835	-3590648.840
60	Ms	1100	0.10	Rock	68323.170	-3590715.566
61	Ms	2100	0.10	Rock	68419.242	-3590791.767
62	Sw	1121	0.60	Sap	69683.394	-3590759.240
63	Gs	2211	0.20	Rock	68937.992	-3592863.566
64	Sw	1121	0.30	Sap	67596.097	-3593762.637
65	Ms	1100	0.10	Rock	66938.568	-3592796.471
66	Ms	1100	0.10	Rock	66522.580	-3591790.050
67	Ms	1100	0.10	Rock	68468.329	-3592715.958

SiVEST Civil Engineering

VCC Estate, North View Building,
170 Peter Brown Drive, Montrose, Pietermaritzburg, 3201
PO Box 707, Msunduzi, 3231
South Africa

Tel + 27 33 347 1600
Fax +27 33 347 5762

Email info@sivest.co.za
www.sivest.co.za

Contact Person: Kurt Barichievy
Cell No.: 084 5549442
Email:Kurtb@sivest.co.za

Annex J

Social Specialist Declaration of Independence

Environmental Resources Management

2nd Floor | Great Westerford | 240 Main Road | Rondebosch | 7700 | Cape Town | South Africa
Tel: +27 (0) 681 5400
Fax: +27 (0) 686 0736

www.erm.com

25 September 2013

Declaration of Consultants Independence

I, Lindsey Bungartz, author of the Socio-economic specialist report, hereby declare that I am employed at Environmental Resources Management (ERM) an independent environmental consultancy. I compiled the Socio-economic Baseline and Impact Assessment Chapters based on independent research and analysis of the proposed Drennan PV Power Facility. I hereby confirm that I have no business, financial, personal or other interest in the activity, application or appeal in respect of which I have been involved. All opinions expressed in my specialist report are my own.

Socio-Economic Specialist Report

The findings of my Socio- economic study have been integrated directly into the Environmental Impact Report. None of my findings have been omitted or changed without my consent.

Refer to *Chapter 6* for the detailed Socio-economic Baseline and *Chapter 12* of the EIR for the detailed Socio-economic Impact Assessment.

Lindsey Bungartz
25 September 2013

Registered Company address
Environmental Resources Management Southern Africa (Pty) Ltd
2nd Floor | Great Westerford | 240 Main Road | Rondebosch | 7700 | Cape Town | South Africa

Company registration number
2003 / 001404 / 07

Directors
Jeremy Soboil (Managing)
Jan Rasmussen
Dr Johanita Kotze
Sue Posnik
John Alexander (UK)
Claudio Bertora (Italy)

Offices Worldwide

A member of the Environment Resources Management Group

Annex K

Environmental and Social Management Programme (EMPr)

CONTENTS

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ABBREVIATIONS

CEMPr	Construction Environmental Management Programme
DEA	National Department of Environmental Affairs
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
EC DEDEAT	Eastern Cape Department of Economic Development Environmental Affairs and Tourism
ECO	Environmental Control Officer
ELC	Environmental Liaison Committee
EMPr	Environmental Management Programme
NEMA	National Environmental Management Act
OEMPr	Operational Environmental Management Programme
SAHRA	South African Heritage Resource Agency - the statutory national body responsible for heritage resource management.
IYLM	Inxuba Yethemba Local Municipality

Bund: Enclosure under / around a storage facility to contain any spillage.

Batch plant: Site for the large-scale mixing and production of concrete or plaster, and associated equipment and materials.

Contractor: The principal persons / company undertaking the construction of the Development.

- The main contractor as engaged by the Developer;
- Selected subcontractors; and
- Any other contractor from time to time engaged by the Developer directly in connection with the construction part of the Works.

Contaminated water: **W**ater contaminated by the Contractor's activities, e.g. concrete water and runoff from plant / personnel wash areas.

Construction camp: The area designated for all temporary site offices, storage sheds and areas, parking areas, maintenance workshops, staff welfare facilities, accommodation, etc.

Construction Environmental Management Programme (CEMPr): The construction phase Environmental Management Programme, containing the Environmental Specifications for Civil and Building Works, also forming part of the civils and building contract documentation.

Engineer: A person representing the Developer on site and who is responsible for the technical and contractual implementation of the works to be undertaken. This is usually the engineer, but may be any other person, such as an architect or project manager, authorized by the Developer to fulfil this role.

Environment: The surroundings within which humans exist and that are made up of the land, water and atmosphere of the earth, *viz*.:

- micro-organisms, plant and animal life;
- any part or combination of the above and the inter-relationships among and between them; and
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Education Programme: An environmental education course for the Contractor's management staff and labour force, which informs them of the requirements of the CEMPr. The ECO will present and co-ordinate such courses.

Environmental Control Officer (ECO): The individual or company appointed by the Developer to ensure the implementation of the CEMPr and suitable environmental management practices on site for the duration of the construction phase of the project.

Environmental Liaison Committee (ELC): The committee responsible for implementing, amending and monitoring the application of the OEMPr. This shall be made up of representatives of the facility management and local authority.

Method Statement: A written submission by the Contractor to the Engineer and ECO in response to the Specifications or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and / or will produce results in accordance with the Specifications.

The Method Statement shall cover applicable details with regard to:

- construction procedures;
- materials and plant to be used;
- transport of materials and plant to and from site;
- how the plant / material will be moved while on site;
- how and where material will be stored;
- the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- timing and location of activities;
- compliance / non-compliance with the Specifications; and
- any other information deemed necessary by the Engineer.

No Go Areas: Areas identified as being environmentally sensitive in some manner and delineated on plan, and on the Project Site with pegs or fencing, and which are out of bounds to unauthorised persons. Authorisation must be obtained prior to entry.

Operational Environmental Management Programme (OEMPr): The operation phase Environmental Management Programme, containing the Environmental Specifications for the on-going maintenance and operational activities, also forming part of the contract documentation.

Potentially hazardous substance: A substance which, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment.

Reasonable: Means, unless the context indicates otherwise, reasonable in the opinion of the Engineer after he has consulted with a person, not an employee of the Employer, suitably experienced in "environmental implementation plans" and "environmental management programmes" (both as defined in the National Environmental Management Act (No 107, 1998)).

Project Site: The (future) primary operational area for the Project activities. Private transport corridors (i.e., those dedicated for use solely by Project operational activities) are included as part of the Site.

PV Footprint: The area that may reasonably be expected to be physically touched by Project activities, across all phases. The Project Footprint includes land used on a temporary basis such as construction lay down areas or construction haul roads, as well as disturbed areas in transport corridors, both public and private.

Solid waste: Means all solid waste, including construction debris, chemical waste, excess cement / concrete, packaging materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Specification: A technical description of the standards of materials and workmanship that the Contractor is to use in the Works to be executed, the performance of the Works when completed and the manner in which payment is to be made.

Works: The construction operations and all related and incidental works, such as site works, earthworks, installation of services, rehabilitation etc., in connection with the execution and carrying to completion of the Development.

Top material: This refers to any surface material in the construction area, whether it be soil, fine material or stones including vegetation.

Topsoil: Means the top 300 mm of soil and may include vegetation and rocks.

1 BACKGROUND TO PROJECT

Solaire Direct Southern Africa (Pty) Ltd (Solaire Direct) appointed Environmental Resources Management Southern Africa (Pty) Ltd (hereafter referred to as ERM) as independent environmental consultants to undertake the Environmental Impact Assessment (EIA) process for the Development of the Drennan PV Power Facility at a Project Site (hereafter referred to as the 'Site') located approximately 28km south of Cradock in the Eastern Cape. The Project development includes the installation and operation of solar panels (PV arrays) with a projected output of up to 90 megawatts (MW) to be constructed in phases over time based on permitted quantities determined by Eskom and the Dept of Energy's awarded BID amount. It is intended that the electricity generated by the Project will feed into the national electrical grid network.

1.1 REGULATORY REQUIREMENT FOR THE EMPR

An Environmental Management Program (EMPr) for the Drennan Photovoltaic (PV) Power Facility is required under the Regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA) (No 107, 1998), as amended). The EMPr tends to become a legally binding document on the applicant as a condition of approval of the Project by the Department of Environment, in addition to other conditions that may be stipulated in the Record of Decision / Environmental License.

1.2 OBJECTIVES OF THE EMPR

The aim of an EMPr is to facilitate appropriate environmental controls during all phases of the project to minimise environmental damage arising from implementation of the Project during construction and operational phases. To achieve this, the EMPr must make recommendations for the planning and design (pre-construction / design phase), specify the limitations the contractor must abide by during construction, detail the issues that should be taken cognisance of and indicate specific actions that must be undertaken so as to ensure that the environment is not unnecessarily damaged. The EMPr thus specifies the framework within which the contractor must carry out operations. Management and monitoring measures for the operational phase are also included to provide environmental guidance for the lifetime of the Development.

In addition, the EMPr provides a clear indication of the responsibilities for environmental management requirements by each of the role players involved in the construction and operational phases of the Development. Guidance for the implementation of the EMPr is provided, including the compilation of

method statements which are required to be implemented to achieve compliance with the Environmental Specifications. Corrective actions in the event of non-compliance with the EMPr are also defined.

No closure or decommissioning EMPr is provided in this EMPr since the activities involved in future decommissioning would likely trigger a requirement to undertake a further Environmental Assessment and EMPr, as would presently be the case in terms of activity 27 of Government Notice 544 of 2010. An Environmental Impact Assessment for decommissioning would assess the impacts and opportunities of decommissioning activities in greater detail than is possible at this time, and would include a specific decommissioning EMPr. The decommissioning EMPr should take into consideration the mitigation measures identified in the Environmental Impact Report (EIR). A detailed decommissioning and rehabilitation plan should be developed prior to decommissioning of the PV power facility that takes into account best available technological options for dismantling and disposal available at the time. This plan should include, but should not be limited to, removal of PV arrays and supporting structures and other infrastructure, management of waste and / or contaminated soil, dust suppression and rehabilitation.

The EMPr is required in order to:

- assist in ensuring continuing compliance with South African legislation and Solaire Direct's Environmental Health and Safety Policy;
- provide a mechanism for ensuring that measures identified in the EIR designed to mitigate potentially adverse impacts, are implemented;
- provide a framework for mitigating impacts that may be unforeseen or unidentified until construction is underway;
- provide assurance to regulators and stakeholders that their requirements with respect to environmental and socio-economic performance will be met; and
- provide a framework for compliance auditing and inspection programs.

The overall EMPr contains sections that specifically deal with the design and planning phase, the construction phase (Construction Environmental Management Programme (CEMPr)) and the operational phase (Operational Environmental Management Programme (OEMPr)).

1.3 STRUCTURE OF THE EMPR

The structure of the EMPr is indicated *Table 1.1*.

Table 1.1 Structure of the EMPr

Section	Heading	Content
Section1	Introduction	Provides background information regarding the Site, Project Development and the EMPr.
Section 2	Implementation of the EMPr	Provides details of the communication and organisational structures within which the EMPr will be implemented, responsibilities of key role players, and provides the terms of reference for the Environmental Control Officer (ECO).
Section 3	Environmental Management Specifications for the Pre-Construction Phase	Provides environmental specifications for the Pre-Construction phase
Section 4	Environmental Management Specifications for Construction Phase (CEMPr)	Provides all construction phase environmental management requirements applicable to the principal construction contractors, and their subcontractors.
Section 5	Environmental Management Specifications for Operational Phase (OEMPr)	Provides all operational phase environmental management requirements applicable to applicant and any sub-contractors.

2 IMPLEMENTATION OF THE EMPR

2.1 INTRODUCTION

This document details the required mitigation measures, and is partly prescriptive, identifying specific people or organisations to undertake specific tasks in order to ensure that impacts on the environment are minimised during the lifecycle of this project. The EMPr is applicable to all work activities during the pre-construction, construction and operation of the Drennan PV power facility. It is an open-ended document implying that information gained during pre-construction, construction and operational activities and / or monitoring of procedures on the Site could lead to changes in the EMPr.

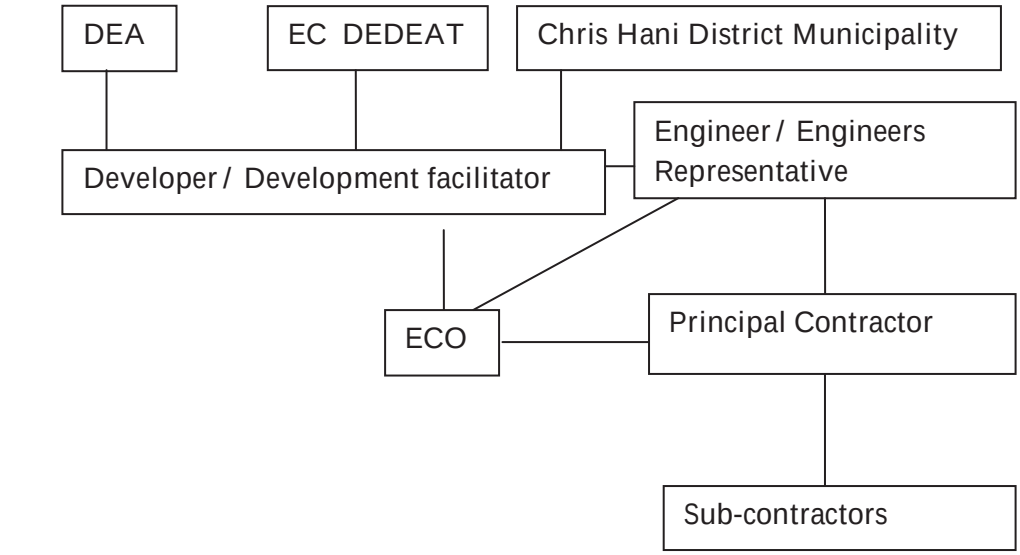
An ECO (Environmental Control Officer) will be appointed to monitor compliance with the EMPr and other Conditions of Approval as they relate to environmental matters. This EMPr specifies responsibility for implementation of the prescribed mitigation measures to various responsible parties who are expected to co-operate closely to minimise or avoid environmental impacts. The Contractor is obliged to inform the ECO and Engineer immediately of events that may cause serious environmental damage or breach the requirements of the EMPr. The ECO in turn will immediately inform Solaire Direct and, if necessary the Local, Provincial and or National Authority, of such events should they likely result in significant residual environmental or social impact.

2.2 ROLES AND RESPONSIBILITIES

The key role-players during the construction phase of the Development, for the purposes of environmental management on the Site, include but are not limited to: the Developer (Solaire Direct), the Engineer, the main Contractors (direct appointments including civil works contractor, building contractor, landscape contractor etc.), the Environmental Control Officer (ECO), and representatives of the relevant Authority / ies.

Details of the responsibilities of each of the key role-players have been provided in *Sections 2.3* to *2.7* below. Lines of communication and reporting between the various parties are illustrated in *Figure 2.1* below.

Figure 2.1 Roles and Responsibilities



2.3 THE DEVELOPER

For the purpose of this document, "the Developer" and its appointed facilitators refers to those to whom permission has been granted to proceed with the Drennan PV Power Facility (i.e. Solaire Direct), and who is thus ultimately responsible for compliance with all conditions of approval of Project Development or any aspect thereof by any authority.

With respect to the **pre-construction phase** of the Project, the Developer is to:

- Implement the recommendations outlined in the pre-construction EMP; and
- Implement as many recommendations as possible that will lessen the total environmental impact of the Project from the design stage, through to construction and ultimately the operational phase.

With respect to the **construction phase** of the Project, the Developer is to:

- Ensure that all relevant approvals and permits have been obtained prior to the start of construction activities on the Site;
- Ensure that the EMPr has been approved by DEA prior to the start of construction activities on the Site;
- Ensure that DEA has been notified of the date on which construction activities will be starting, prior to commencement of the activity;
- Ensure that all conditions of approval have been complied with;
- Appoint the required specialists to make input into the pre-construction / design phase (refer to *Section 3.2)*; and

- Appoint a suitably qualified or experienced ECO prior to the start of construction activities on the Site, and for the duration of the construction phase.

With respect to the **operational phase** of the Project, the developer is to:

- Ensure that operation of the PV power facility is undertaken in line with the requirements of the operational phase EMPr; and
- Continuously seek to improve any negative environmental impacts which result from the operational phase.

2.4 THE ENGINEER

For the purposes of this document, "The Engineer" refers to the engineer for the Project, or any other person authorised by the Developer, to be responsible for the technical and contractual implementation of the works to be undertaken.

The responsibilities of the Engineer are to:

- Ensure that the requirements as set out in this EMPr and any other conditions stipulated by the relevant Authorities are implemented;
- Assist the ECO in ensuring that the conditions of the Construction Environmental Management Programme (CEMPr) are adhered to and promptly issue instructions requested by the ECO to the Contractor. All instructions relating to environmental matters issued by the Engineer at the Site to the Contractor are to be copied in writing to the ECO;
- Assist the ECO in making decisions and finding solutions to environmental problems that may arise during the construction phase;
- Review and approve construction method statements with input from the ECO;
- Order the removal of person(s) and/or equipment not complying with the specifications (as required by the ECO or otherwise); and
- Provide input into the ECO's on-going internal review of the EMPr.

2.5 THE CONTRACTOR

For the purposes of this document "The Contractor" refers to any company or individual appointed by the Developer to implement any aspect of the works.

The Contractor is to:

- Ensure implementation of all applicable Environmental Specifications during all works on the Site, including all additional requirements as may be contained in approved method statements.

- Ensure that all sub-contractors', employees, suppliers, agents etc. are fully aware of the environmental requirements detailed in the Environmental Specifications;
- Liaise closely with the Engineer and the ECO and ensure that the works on the Site are conducted in an environmentally controlled manner;
- Inform the Engineer as well as the ECO should environmental conditions on the Site deteriorate, e.g. dumping, pollution, littering and damage to vegetation; and
- Carry out instructions issued by the Engineer, on request of the ECO, required to comply with the CEMPr.

2.6 *ENVIRONMENTAL CONTROL OFFICER*

During the construction phase of the project, the ECO is to:

- Ensure that the Contractor has a copy of the CEMPr and all agreed method statements;
- Undertake regular Site inspections (with frequency determined by the nature of the on-site activities as may be appropriate) to audit compliance of all parties with the requirements of the CEMPr;
- Advise / recommend on actions or issues impacting on the environment to the Engineer, who shall issue any required Site instructions to the Contractor;
- Conduct environmentally education and awareness training with the Contractor and his / her staff on key requirements of the EMPr, environmental safeguards, good housekeeping practices, and general aspects relating to Site sensitivity. ;
- Review and approve construction / landscape method statements together with the Engineer / Landscaper (when applicable);
- Assist the Contractor in finding environmentally responsible solutions to problems that may arise;
- Recommend to the Engineer the removal of person(s) and / or equipment not complying with the Specifications;
- Undertake photographic monitoring of the construction at the Site;
- Keep records of all activities / incidents concerning the environment on the Site in a Site Diary / Logbook;
- Complete temporary and permanent site closure checklists;
- Take immediate action on the Site to stop works where significant and irreparable damage is being inflicted on the environment, and to inform the Engineer immediately of the occurrence and action taken; and
- Undertake regular internal review of the EMPr and make recommendations regarding its updating to the Engineer and Developer.

The ECO has the authority to recommend to DEA that works be stopped if in his/her opinion serious harm to, or impact on the environment is likely to occur or has occurred and such actual or potential harm or impact is in contravention of the EMPr, and which is or may be caused by construction or related works.

In the event of failure by the Contractor or Contractor's employee to show adequate consideration to the environmental aspects of this contract, the ECO may recommend to the Engineer and the project management team to have the Contractor's representative or any employee(s) removed from the Site or to suspend work until the matter is remedied.

The ECO shall keep a Site Diary or Logbook in which events and concerns of environmental significance are to be recorded. The ECO will compile a monthly report of such events, concerns and general compliance of the Contractor with the construction phase requirements of the EMPr. The ECO's monthly report will be submitted to the Engineer and if required, to DEA, EC DEDEAT and the Chris Hani District Municipality. The ECO is also required to attend regular meetings of the project management team to report on environmental issues and to minute the requirements that emerge.

The ECO will be responsible for the compilation of a final completion checklist for the project, completed when all construction works related to the Project have terminated and the Site has been cleared of all construction related debris, materials or equipment not forming part of the permanent works. The completion checklist will audit the Contractor's compliance with the construction phase requirements of the EMPr throughout the duration of the construction phase and, together with a final written report, will be submitted to DEA, EC DEDEAT and the Chris Hani District Municipality in order to achieve "environmental closure" for the construction phase of the project.

2.7 COMMUNICATION CHANNELS ON THE SITE

2.7.1 Site Meetings during the Construction Phase

The ECO is required to attend regular meetings of the Project management team to facilitate the transfer of information and to update all parties on the environmental compliance of the project as a whole. The ECO or delegated person will minute the discussions, and specifically any decisions arising relating to environmental management actions and responsibility .

The ECO will compile a summary report outlining the main construction activities relating to the environment, aspects of non-compliance, and document agreed environmental actions and dates of achieving compliance by the Contractor.
The summary report will form part of the construction phase EMPr records. .

The following people should attend these meetings:

- Developer's Representative;
- Engineer;
- Landscape Architect (when applicable);
- The ECO; and
- Contractor(s) representative (eg Site Manager).

2.7.2 Environmental Education and Awareness

The Contractor, in consultation with the ECO, shall arrange for a presentation to site staff to familiarise them with the environmental requirements of the construction phase of the EMPr within seven days from the commencement date of construction. This presentation should take cognizance of the level of education, designation and language preferences of the staff. General site staff would commonly receive a basic environmental awareness presentation or talk highlighting general environmental and social "do's and don'ts", including good housekeeping practices. This information would be provided throughout construction in the form of regular toolbox talks. Management level staff on the Site, e.g. Site agents and foremen, who require more detailed knowledge about the environmental sensitivities on site and the construction phase requirements of the EMPr, will benefit from a separate and more detailed presentation of these issues. If required, the ECO may call upon the services of a professional trainer or environmental consultant to present the technical contents of the EMPr.

Environmental education of staff can be assisted by compilation of posters placed in staff venues eg canteens and site offices..

2.7.3 Method Statements

The Contractor shall compile and provide Method Statements to the ECO and the Engineer for approval prior to work commencing on construction activities. Method statements will be required for specific activities that are deemed or identified to pose a risk to the environment and / or which require site specific detail beyond that contained in the EMPr or when requested by the Engineer or ECO.

A Method Statement is a "live document" in that modifications are negotiated between the Contractor and the ECO / project management team, as circumstances unfold. Changes to, and adaptations of, Method Statements can be implemented with the prior consent of all parties. All Method Statements will form part of the construction phase of the EMPr documentation and are subject to the terms and conditions contained within the construction phase of the EMPr.

Note that a Method Statement is a starting point for understanding the nature of the intended actions to be carried out and allows for all parties to review and understand the procedures to be followed in order to minimise risk of harm to the environment.

A Method Statement describes the scope of the intended work in a step-by-step description, in order for the ECO and the Engineer to understand the Contractor's intentions. This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks.

For each instance where it is requested that the Contractor submit a Method Statement to the satisfaction of the Engineer and ECO, the format should clearly indicate the following:

- What - a brief description of the work to be undertaken;
- How - a detailed description of the process of work, methods and materials;
- Where - a description / sketch map of the locality of work (if applicable);
- When - the sequencing of actions with due commencement dates and completion date estimates;
- Who – The person responsible for undertaking the works described in the Method Statement; and
- Why – a description of why the activity is required.

All Method Statements must be developed to the satisfaction of the ECO, Engineer and, where practical or stipulated in the Environmental Authorisation, should be endorsed as being acceptable by the environmental representative of the EC DEDEAT.

A list of possible Method Statements that the Contractor may be required to submit during the course of the construction contract is provided in Section 4, along with an indication of those which the ECO may require the Contractor to provide prior to the start of works on the Site.

2.7.4 ECO Diary/Logbook Entries

The ECO will maintain a Site diary or logbook that relates to environmental issues as they occur on the Site for record keeping purposes. Recorded issues will form part of feedback presented at Project meetings by the ECO.

2.7.5 Site Memo Entries

Site memos, stipulating recommended actions required to improve compliance with the construction phase of the EMPr by the Contractor, will be

issued by the ECO to the Engineer, who in turn will ensure that the Contractor is informed of the recommended instruction.

Comments made by the ECO in the Site Memo book are advisory and all consequential Site Instructions required may only be issued by the Engineer. Site Memos will also be used for the issuing of stop work orders to the Contractor for activities deemed to pose immediate and serious risk of unnecessary damage to the environment.

2.7.6 Legislative Framework

Obligations imposed by the EMPr are legally binding in terms of environmental statutory legislation (i.e. the Environmental Authorization in terms of the National Environmental Management Act No.107 of 1998, as amended) and in accordance with any other requirements specified by the Department of Environment.

The requirements of this EMPr do not release the Developer from the requirements of any other legislation that may be applicable to the project such as those listed below.

- National Environmental Management Act (No 107 of 1998);
- National Heritage Resources Act (No 25 of 1999);
- National Water Act (No 36 of 1998);
- National Environmental Management: Biodiversity Act (NEMBA) (No 10 of 2004);
- Conservation of Agricultural Resources Act (No 43 of 1983);
- Occupational Health and Safety Act (No 385 of 1993); and
- Hazardous Substances Act (No 63 of 1977).

Legislation pertaining to flora specifically

- Ciskei Act (1987)
- Nature and Environmental Conservation Ordinance 19 of 1974
- Transkei Decree (no 9 of 1992)

Specifically,

63.(1) No person shall
(a) uproot the plant in the process of picking the flower of any flora;
1 Para. (a) substituted by s. 17 of Ord. 26 of 1986.]
(b) without a permit—
(i) pick any endangered or protected flora, or
(ii) pick any flora on a public road or on the land on either side of such road within a distance of ninety metres from the centre of such road, or

c) pick any protected or indigenous unprotected flora on land of which he is not the owner, without the permission of the owner of such land or of any person authorised by such owner to grant such permission.
(2) No permission granted in terms of subsection (1) (c) shall be valid unless it is reduced to writing and reflects—
(a) the full names and address of the owner of the land concerned or of the person authorised to grant such permission;
(b) the full names and address of the person to whom permission is granted, and
(c) the number and species of flora, the date or dates on which such flora may be picked and the land in respect of which permission is granted,
and is signed and dated by such owner or the person authorised by him.
(3) The provisions of subsection (1) (b) shall not apply to the owner of any land, any relative of such owner and any full-time employee of such owner acting on the instructions or with the consent of such owner, in respect of any protected or indigenous unprotected flora on such land.
(4) The provisions of subsection (1) (b) (i) shall not apply to any person authorised in writing by the owner of any land to pick any protected flora.

2.7.7 Dispute Resolution

Any disputes or disagreements between role players on the Site (with regard to environmental management) will firstly be referred to the Engineer during the construction phase, or to an EC DEDEAT officer during the operational phase. If no resolution on the matter is reached by either the Engineer and/or EC DEDEAT officer, the matter will be referred to the DEA for clarification.

2.7.8 Community Relations

Solaire Direct should continue to engage with stakeholders throughout project construction and operation. Communication with local communities and other local stakeholders will be a key part of this engagement process and is one where Solaire Direct and the Contractor will need to work closely during the construction period. Development of a Community Engagement Plan (CEP) is important to guide and provide a framework for this communication.

The objectives of communication and liaison with local communities are the following:

- To provide residents in the vicinity of the Project and other interested stakeholders with regular information on the progress of work and its implications;
- To monitor implementation of mitigation measures and the impact of construction on communities via direct monitoring and feedback from those affected, in order to ensure the mitigation objectives are achieved; and

- To manage any disputes between Solaire Direct, the Contractors and local communities.

This engagement process can serve to inform the establishment of a local Community Trust linked to the project (see *Chapters 6* and *12* of the EIR).

Grievance Procedure

Solaire Direct should develop a grievance procedure to ensure fair and prompt resolution of problems arising from the project. The grievance procedure should be underpinned by the following principles and commitments:

- Implement a transparent grievance procedure, and disseminate key information to directly impacted stakeholders;
- Seek to resolve all grievances timeously; and
- Maintain full written records of each grievance case and the associated process of resolution and outcome for transparent, external reporting.

The responsibility for resolution of grievances will lie with Solaire Direct and its Contractors.

2.7.9 Social Responsibilities

The Developer and Contractors shall encourage and implement wherever possible the procurement of locally based labour, skills and materials. Solaire Direct will develop a project specific Procurement and Recruitment Policy.

2.7.10 Recycling of Waste

Wherever possible, in order to adhere to waste minimisation principles, materials used or generated by construction and operation will be recycled or reused. Containers for glass, paper and metals will be provided separate to general waste bins particularly in office and camp areas during Construction. Where possible and practical,waste should be sorted for recycling (eg, at stores and offices). Recycling protocols will sort materials into the following categories:

- Paper / cardboard;
- Any packaging materials suitable for re-use;
- Plastics;
- Aluminium;
- Metals (other than aluminium);

- Wood;
- Organic waste;
- Glass; and
- Clean Building Rubble.

3 PRE- CONSTRUCTION EMPR

3.1 SCOPE AND APPLICATION

This section covers the mitigation measures and recommendations required during the pre-construction and detailed design stage of the Drennan Photovoltaic (PV) Power project.

3.2 PRE-CONSTRUCTION EMPR REQUIREMENTS

3.2.1 Directives in Respect of the Micro-siting Process

The preferred site layout must be finalised through a micro-siting design process which will include a detailed site assessment of the final site layout by various specialists. Relevant authorities will be given the opportunity to comment on the final design layout and this layout must be approved by DEA. A methodology for finalising the design layout is outlined below.

3.2.2 Analysis of Solar Resource Data and Refining of Layout

The environmental assessment process has culminated in the identification of a preferred PV Footprint for the activity, as well as certain "no-go" areas for the development.

From a technical perspective, the layout of the PV Footprint depends on a number of factors, including:

- local topographical conditions and the aspect of the Site in relation to the sun's daily movements;
- the intensity of the solar resource at the Site as determined from on-site measurements and data modelling;
- other local meteorological conditions such the amount of suspended particles in the air (dust); and
- the characteristics of the specific PV panel model that is selected for the Project including the size and internal composition.

Solaire Direct must complete the technical analysis outlined above, and use this information to compile a detailed Site layout which complies with both the preferred PV Footprint assessed in the EIA, as well as the relevant buffer zones and "no-go" areas identified.

3.2.3 *Permit Requirements*

Activities undertaken during Site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. Solaire Direct is responsible for ensuring that they hold the necessary permits in order to comply with national and local regulations. Additional permit requirements that may be required are described below.

Water Use

Licensing procedures that must be followed for particular "water uses" relevant to solar facilities and associated road construction include the following:

- Taking of water from a water resource, including a water course, surface water, estuary or aquifer (i.e. borehole);
- altering the bed, banks, course or characteristics of a water course; and / or
- impeding or diverting of a flow in a water course.

Under the National Water Act (No 36 of 1998), either a General Authorisation or a Water Use Licence may be required for the project.

3.2.4 *Tender Documentation*

Solaire Direct shall ensure that this EMPr is included within the tender documents for all Contractors tendering to undertake any aspects of the construction phase of the project. Costs of compliance with the EMPr must be adequately allowed for in the adjudication of tenders.

3.2.5 *Additional Pre – Construction Requirements*

- Notify all registered I&APs and key stakeholders of the opportunity for appeal of the Environmental Authorisation.
- Notify DEA prior to commencement of construction.
- A Health and Safety Plan must be developed prior to the commencement of construction, to identify and avoid work-related accidents.
- Solaire Direct should establish a recruitment and procurement policy which sets reasonable targets for the employment of South African and local residents / suppliers. All Contractors should be required to procure goods and services and recruit labour in terms of Solaire Direct's Recruitment and Procurement Policy.
- A Code of Conduct must be developed for all workers (Solaire Direct and Contractors including their workers) directly related to the project. The objective of the code of conduct is to limit, where possible, social ills brought about by the construction and operation of the PV power facility.

3.3 PRE-CONSTRUCTION PLANNING PHASE

In order to ensure compliance with environmental legislation and best practice guidelines, the following actions are applicable to the pre-construction planning phase for the PV power facility. The persons responsible for implementation of the actions are listed in the table below, the majority of which are the responsibility of Solaire Direct.

Key activities during the pre-construction planning phase will include:

- Pre-construction monitoring;
- Notification of DEA of final layout (if required) and additional mitigation / management measures, where needed;
- Drafting of subsidiary plans, policies and procedures;
- Developing with the Contractor the following:
  - A Site Layout Plan,
  - Method Statements.

These activities are described in more detail in the matrix below.

PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
1.	Stakeholder engagement	Notify all registered Interested and Affected Parties of Environmental Authorisation (EA).	1.1	Notify all registered I&APs and key stakeholders of the opportunity for appeal of the Environmental Authorisation.	Notices sent to relevant parties on the stakeholder database. List of those to whom it was sent on file.	ERM	Within the number of DEA-required days from the issuing of the Environmental Authorisation.
2.	Permit Requirements	Ensure compliance with legal and other permitting requirements.	2.1	Ensure that all relevant legal requirements have been met.	Permits	Solaire Direct	Prior to construction
3.	Finalisation of EMPr and Contractor Compliance Standards	Update EMPr with EA conditions and other mitigation measures from monitoring.	3.1	Incorporate additional mitigation measures specified by DEA in the EA into the EMPr and Contractor Compliance Standards.	EMPr and Contractor Compliance Standards	Solaire Direct	Prior to construction
4.	Notification to DEA: Director of Compliance Monitoring	Ensure that DEA are notified of commencement date.	4.1	Notify DEA prior to commencement of construction.	Proof of communication	Solaire Direct	14-days in advance of commencement of construction.
		Keep DEA informed of any aspects of non-compliance with EMPr or EA	4.2	Notify DEA with reasons if any provisions of the EMPr or EA cannot be implemented, and provide alternative	DEA notification	Solaire Direct	Prior to construction
		Keep DEA informed of current contact details of applicant.	4.3	Notify DEA of any change of contact details of the applicant	DEA notification	Solaire Direct	Prior to construction
		Keep DEA informed of contact details of ECO	4.4	Submit the name and contact details of the appointed ECO prior to construction	DEA notification	Solaire Direct	Prior to construction
5.	Subsidiary Plans	Develop Subsidiary Plans to minimises environmental and social risks	5.1	The following subsidiary plans may be required prior to construction: • Health and Safety Plan • Traffic Management Plan • HIV Policy and Awareness Plan • Rehabilitation Plan • Policy for assessing all damages and losses • Recruitment Policy • Procurement Policy • Code of Conduct • Grievance Procedure • Waste Management Plan • Community Engagement Plan	Subsidiary plans	Solaire Direct	Prior to construction

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PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
				These are referred to below, where relevant.			
6.	Health and Safety	Ensure the health and safety of site personnel during construction.	6.1	A Health and Safety Plan must be developed prior to the commencement of construction to identify and avoid work related accidents. This shall include: • Safety zones from residences, roads, rights of way. • Chemical ablution facilities.	Health and Safety Documentation	Solaire Direct	Prior to construction
7.	Procurement of Services and Tender Procedures	Ensure that procurement of local, regional and national services is maximised:	7.1	Establish a procurement policy which sets reasonable targets for the procurement of goods and services from South African residents /suppliers, particularly local residents as far as possible.	Procurement policy	Solaire Direct	Prior to construction
			7.2	Procurement should advertise tenders in local and national newspapers.	Local and national advertisements		
			7.3	Procurement processes should identify and invite bids from local suppliers.	Invited bids from local suppliers		
			7.4	Adopt transparent adjudication process for local suppliers.	Demonstrate transparent process of adjudicating tenders		
			7.5	The conditions of the 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 percent 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 percent of the subcontract value to be spent on local enterprises.	Percentage targets for local Enterprise Development are met		
			7.6	Solaire Direct will include requirements for local employment in the contracts that they establish with subcontractors and require that all contractors recruit in accordance with the Solaire Direct recruitment			

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PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
				policy and RFP documents.			
			7.7	Solaire Direct will work with the Local Municipality, community representatives and NGOs to identify suppliers with the appropriate level of capacity to supply goods and services over the operational lifetime of the project (specifically BBBEE companies).			
			7.8	Solaire Direct will offer assistance to local companies to ensure that barriers to entry are reduced, for example by assisting companies to complete the required tender documents.			
			7.9	Solaire Direct to work closely with the suppliers to provide the requisite training to the workers. The training provided will focus on development of local skills.			
			7.10	Solaire Direct to ensure that the appointed project contractors and suppliers have access to Health, Safety, Environmental and Quality training as required by the Project. This will help to ensure that they have future opportunities to provide goods and services to the sector.			
8.	Employment & Recruitment	Ensure that employment of local people is maximised	8.1	Solaire Direct will work closely with the relevant local authorities, community representatives and NGOs to ensure the use of local labour is maximised. This should include: • sourcing and using available skills/ employment databases that the local authorities may have; • where no database is available, Solaire Direct to establish a database in consultation with the Inxuba Yethemba Local Municipality (IYLM), community representatives and NGOs (this database will be shared with contractors); and • advertising employment opportunities through the Local Municipality and using local media.	Database of local skills used to recruit local labour; job advertisements	Solaire Direct	Prior to construction
			8.2	Ensure that the appointed project contractors and suppliers have access to Health, Safety, Environmental and Quality training as required by the project.	Proof of HSE training		
			8.3	Solaire Direct will establish a recruitment policy which will set reasonable targets for the employment of local residents from the IYLM. The policy will be aligned with the requirements of the DoE as stipulated in the RFP Documents and, where possible, Solaire Direct will strive to exceed these requirements.	Meet targets for local recruitment		

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PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
			8.4	The Recruitment Policy will also promote the employment of women to ensure that gender equality is attained as defined in the Employment Equity Act (No 55 of 1998).	Recruitment Policy		
			8.5	Solaire Direct will notify identified representatives of the Local Municipality of the specific jobs and the skills required for the project. This will give the local population time prior to the commencement of construction to attain the relevant skills/qualifications to be employable on the project.	Proof of notification of municipality representatives for jobs		
			8.6	Solaire Direct will initiate training and skills Development programmes prior to the commencement of construction, as a means of ensuring that members of the local workforce are up-skilled and can be employed on the project.	Training material and records		
9.	Social Ills and disruption	To limit, where possible, social ills brought about by the construction and operation of the renewable energy facility	9.1	Develop an induction programme, including a Code of Conduct, for all workers.	Code of Conduct	Solaire Direct	Prior to construction
			9.2	All workers will agree to the Code of Conduct and be aware that contravention of the Code could lead to dismissal.	Code of Conduct		
			9.3	A Grievance Procedure will be established whereby complaints are recorded and responded to.	Grievance Procedure		
			9.4	A HIV Policy and Awareness Plan must be developed and implemented.	HIV Policy		
			9.5	Ensure contractor does not undertake recruitment at the Site (to avoid work-seekers camping and queuing at the Site).			
10.	Property Prices and Desirability of Property	Minimise the negative impacts on property prices.	10.1	Design the Site layout in a manner that limits the PV Footprint and all associated infrastructure.	Site Layout Plan	Solaire Direct	Prior to construction
			10.2	Prepare a site Rehabilitation Plan that will be implemented post construction and as part of the decommissioning phase.	Rehabilitation Plan		
			10.3	All directly affected and neighbouring farmers will be able to lodge grievances with Solaire Direct using the Grievance Procedure.	Grievance Procedure		
11.	Traffic Impact	Minimise negative effects	11.1	Solaire Direct will develop a Traffic Management Plan including strict	Traffic Management	Solaire Direct	Prior to construction

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PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
		associated with the increase in traffic.		controls over driver training, vehicle maintenance, speed restrictions, appropriate road safety signage, and vehicle loading and maintenance measures.	Plan		
			11.2	All necessary transportation permits will be applied for at this stage and obtained from the relevant authorities, including permits for abnormal loads if relevant. Oversee development of permits required by contractors.	Transport Permits		
12.	Waste and effluent	Prevent soil and/or groundwater contamination from waste and effluent.	12.1	A suitable area for waste skips must be selected, away from drainage lines.	Site Layout Plan	Solaire Direct	Prior to construction
			12.2	A suitable area for the temporary waste storage areas and secure waste skips must be selected, away from drainage lines, and included in the final Site layout plan with approval by the Environmental Control Officer (ECO).			
			12.3	A Waste Management Plan (WMP) for the Project will be developed. This will follow the principles of waste minimisation at source, segregation for reuse, recycling, treatment or disposal.	WMP in place		
13.	Soil compaction and erosion	Minimise soil compaction and erosion	13.1	Workers are to use existing farm tracks as far as possible. If vehicles must leave the road, they should utilize a single track and should not take multiple paths.	Site Layout Plan	Solaire Direct	Prior to construction
			13.2	Maintain adequate breadth and width below panels and supports so as not to trap debris. Protect disturbed surfaces against erosion.			
14.	Surface water runoff	Minimise erosion	14.1	Keep open any drainage lines or hydraulic corridors identified traversing the site, especially immediately below the culvert outlets (at the railway).	Site Layout Plan	Solaire Direct	Prior to construction
			14.2	Should the drainage lines not be avoided, maintain adequate breadth and width below panels and supports so as not to trap debris.			
15.	Loss of Vegetation	Minimise impacts associated with vegetation loss	15.1	Mow the vegetation down to the required height rather than using destructive clearing methods, where possible.	ECO Report	Solaire Direct	Prior to construction
			15.2	Avoid placing solar infrastructure in close proximity to drainage lines.	Site Layout Plan		
			15.3	Sensitive areas as demarcated on the ecological sensitivity map in the EIR will be avoided as far as possible, and where these areas must be traversed by roads or infrastructure, specific precautions should be	Ecological Sensitivity Map		

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PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
				taken to ensure that impacts are minimized.			
16.	Faunal Impacts	Minimise impacts to onsite fauna	16.1 16.2	Measures to minimise habitat loss described above should be implemented to minimise impacts to fauna. Security fencing surrounding the site should be constructed so as to allow the free movement of small animals, especially during the construction phase when animals may need to leave the site.	Site Layout Plan	Solaire Direct	Prior to construction
17	Avifauna Impacts	Minimise impacts on avifauna	17.1 17.2 17.3 17.4	Pre-construction review of all transmission infrastructures for bird-friendly design features. Undertaken a Site survey immediately before the start of construction by an appropriately qualified ornithologist to determine if and where any priority species are roosting or nesting in close proximity to the inclusive development area. Ensure that no development is planned for any areas known to contain breeding or roosting Sites or priority species, and ensure that all the wetland and vlei areas are buffered against any development or disturbance as per the ecologically sensitive no-go areas A set of at least eight walk-transect routes, each of at least 500 m in length, should be established in areas representative of all the avian habitats present within a two kilometres radius of centre of the Site. Each of these should be walked at least once every two months over the six months preceding construction. The transects should be walked after 06h00 and before 09h00, and the species, number and perpendicular distance from the transect line of all birds seen should be recorded for subsequent analysis and comparison.	Site Layout Plan	Solaire Direct	Prior to construction
18.	Refuse disposal	Ensure correct disposal of waste products	18.1 18.2	Refuse removal agreement entered with Council or private contractor. Provision of suitable waste disposal containers at operations and maintenance buildings.	Visual inspection	Solaire Direct / Appointed Representative	Prior to construction
19.	Visual Impacts	Minimise visual impacts	19.1 19.2	Surface disturbance for internal compacted gravel roads and temporary construction camp should be minimized and erosion control and dust suppression undertaken to minimize exposed soil. Disturbance of areas of indigenous vegetation should be minimized and disturbed areas should be prioritized for construction facilities.	Site Layout Plan and building designs	Solaire Direct	Prior to construction

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PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency & Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
			19.3	Signage related to the enterprise are to be discrete and confined to the entrance gates. No other corporate or advertising signage, particularly billboards or flags, to be permitted.			
			19.4	Visual buffer zones from the N10, district roads, the rail line and farm boundaries have been recommended and applied to the layout.			
			19.5	All cables should be located underground as far as possible.			
			19.6	The substations, gatehouses and maintenance and storage buildings should be grouped as far as possible to avoid the scatter of buildings in the open landscape.			
			19.7	The design of the buildings should be compatible in scale and form with rural buildings, such as farm barns, in the surrounding area.			
			19.8	All yards and storage areas to be enclosed by masonry walls or screens.			
			19.9	The colour of the solar array structures, such as the supports and the rear of the panels, should be carefully selected, and to be in the dark grey or green range, to minimise visibility and avoid reflectivity.			
			19.10	External lighting should be confined to the substation and maintenance areas. Lights should be low-level and fitted with reflectors to avoid light spillage.			
20.	Archaeology, Palaeontology and Cultural Heritage Impacts	Minimise archaeology, palaeontology and cultural Heritage impacts	20.1	The Project should not be visible from the Transnet railway line. Other considerations include visibility from the N10.	ECO Report	Solaire Direct	Prior to construction
			20.2	The PV Footprint will avoid the Kraal and Grave Sites through the application of a 10m buffer zone around these sites.	Site Layout Plan		

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4 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME (CEMPR)

4.1 SCOPE

This Specification covers the requirements for controlling the impact on the environment of all construction activities for the Drennan Photovoltaic (PV) Power Facility. All construction activities shall observe the requirements of this specification as well as any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment.

4.2 APPLICATION

This Specification contains clauses that are generally applicable to the undertaking of civil engineering works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment. The roles and responsibilities in terms of the application and implementation of this Specification have been outlined in *Section 2* above.

4.3 METHOD STATEMENTS

Any Method Statement required by the Engineer or the Environmental Specification shall be produced within such reasonable time as the Engineer shall specify or as required by the Specification. The Contractor shall not commence the activity until the Method Statement has been approved and shall, except in the case of emergency activities, allow a period of two weeks for approval of the Method Statement by the Engineer. Such approval shall not unreasonably be withheld.

The Engineer or ECO may request a Method Statement for any activity they believe may impact on the environment. The Engineer in consultation with the ECO may also require changes to a Method Statement if the proposal does not comply with the Specification or, if in the reasonable opinion of the Engineer, the proposal may result in, or carry a greater than reasonable risk of, damage to the environment in excess of that permitted by the Specifications. Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. The Contractor shall carry out the Works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the Contract.

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The following Method Statements shall be provided by the Contractor and submitted to the Engineer and ECO at least 7 working days before site establishment:

4.3.1 *Temporary Construction Camp and Site Division*

The location, layout and method of establishment of the temporary construction camp (including all buildings, offices, lay down yards, vehicle washing areas, fuel storage areas, batching areas and other infrastructure required for the construction of the project).

4.3.2 *Vegetation Clearing*

Method of vegetation clearing during site establishment and disposal procedure for cleared material.

4.3.3 *Topsoil*

Method of clearing topsoil and location of topsoil stockpiles including erosion protection.

4.3.4 *Access/Haul Routes*

Details, including a drawing, showing where and how the access points and routes will be located and managed, including traffic safety measures.

4.3.5 *Fuel Storage and Use*

The design, location and construction of the fuel storage area, for the filling and dispensing from storage tanks and management of drip trays.

4.3.6 *Solid Waste Management*

Expected solid waste types, quantities, methods of recycling to be employed, monitoring and record keeping procedures, staff responsible for the oversight of waste management and recycling and frequency of collection and disposal of the non-recycled component, as well as location of disposal sites.

4.3.7 *Contaminated Water*

Methods of minimising, controlling, collecting and disposing of contaminated water.

4.3.8 *Hazardous Substances*

Details of any hazardous substances / materials to be used, together with the transport, storage, handling and disposal procedures for the substances.

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4.3.9 *Cement and Concrete Batching*

Location, layout and preparation of cement / concrete mixing areas including the methods employed for the mixing of concrete, and particularly the containment of runoff water from such areas, as well as the method of transportation of concrete.

4.3.10 *Emergency Procedures*

Emergency procedures for fire and accidental leaks and spillages of hazardous substances (including fuel and oil). Include details of risk reduction measures to be implemented, such as fire fighting equipment, fire prevention procedures and spill kits (materials and compounds used to reduce the extent of spills and to breakdown or encapsulate hydrocarbons).

Other Method Statements required by the Engineer and ECO during the course of construction are to be provided by the Contractor a minimum of 14 working days prior to commencement of the works or activities to which they apply (these activities may not commence on site before these Method Statements have been approved except in the case of emergency activities).

4.3.11 *Erosion and Sedimentation Control*

The proposed methods of Sedimentation and Erosion Control for bulk earthworks in particular and the remainder of the construction period, in order to ensure the prevention of sedimentation of water courses and storm-water infrastructure.

4.4 *SITE ESTABLISHMENT*

4.4.1 *Site Division*

The Contractor shall restrict all his activities, materials, equipment and personnel to within the area specified, and shall restrict his activities to only those areas that are necessary to undertake the works.

A Method Statement detailing the layout and method of establishment of the temporary construction camp, all buildings, offices, lay down areas, fuel storage areas, batching areas and other infrastructure required for the running of the project shall be submitted.

Disturbed areas rather than pristine or intact landscape areas should preferably be used for the temporary construction camp.

4.4.2 *Site Demarcation*

The Contractor shall erect and maintain permanent and / or temporary fences

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of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities. The temporary construction camp, material stores and lay-down areas should be screened and sited as far away as possible from the local roads.

4.4.3 Site Clearance

Topsoil

If topsoil / top material shall be removed from areas cleared of vegetation, it will be retained for future landscaping use. Top material should exclude litter, building rubble, alien plant material or any other waste. All topsoil, and specifically any topsoil from areas which are likely to contain bulbs, must be stripped and stockpiled for re-use in landscaped areas. This will constitute at least a 300 mm layer.

Topsoil shall be stored in areas demarcated by the ECO and Engineer and in piles not higher than 2 m, and may not be removed from the Site, or used for any purpose other than in the final landscaping of the Site. The stockpiles shall not be compacted or disturbed, and shall be domed at the top to promote runoff. The period between the stockpiling of topsoil and its utilization shall be as short as possible, and ideally the topsoil should be transferred to its intended site of use immediately following site clearance and stockpiling. This would also avoid double handling.

Stockpiles that are to be stored for less than three months should be covered with shade-cloth or geotextile fabrics or similarly suitable material to prevent erosion, and kept moderately moist in order to maintain the vitality of the soil. If stockpiles are to be stored for more than three months a protective vegetation layer must be established to cover topsoil stockpiles in order to protect them against erosion and desiccation. The stockpile must be kept moist in order to maintain the vitality of the vegetation. Vegetation may not consist of invasive alien vegetation, but must comprise grass or ground covers.

4.4.4 Access Routes/ Haul Roads

The Contractor shall control the movement of all vehicles including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition, such vehicles shall be so routed and operated as to minimise disruption to regular users of the routes not on the site. The vehicles of the Contractor and his suppliers shall not exceed a speed of 30 km / h on gravel or earth roads on site and within 500 m of the site.

During construction, arrangements and routes for abnormal loads (if required) must be agreed in advance with the relevant authorities and the appropriate permit must be obtained for the use of public roads.

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4.5 GENERAL REQUIREMENTS

4.5.1 Materials Handling, Use and Storage

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to, sand, stone chips, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

All manufactured and / or imported material shall be stored within the Contractor's temporary construction camp. All lay down areas outside of the temporary construction camp shall be subject to the Engineer's approval.

All building materials should be stored at least 50 m away from aquatic ecosystems and the areas bunded appropriately such that there will be no runoff from these areas towards aquatic systems. All building materials should be removed after construction.

4.5.2 Fuel (Petrol and Diesel) and Oil

All fuel is to be stored within a demarcated area in the Contractor's temporary construction camp. No refuelling of vehicles or machinery is to take place outside of this demarcated area unless authorised by the Engineer. The Engineer shall be advised of the area that the Contractor intends using for the storage of fuel.

The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut. Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks shall be sealed and stored in an area where the ground has been protected.

Tanks containing fuels shall be situated on a smooth impermeable surface (plastic or concrete) base with a bund (if plastic, it must have sand on top to prevent perishing) to contain any possible spills and prevent infiltration of fuel into the ground. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall make up 110 percent of the total capacity of all the storage tanks.

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The floor of the bund shall be sloped towards an oil trap or sump to enable any spilled fuel to be removed. An Enretech or similar hydrocarbon absorption / remediation product approved by the ECO shall be installed in the sump to reduce the risk of pollution. Bulk fuel storage and bunded areas shall have overhead cover to prevent rain from entering the bunded area. The Contractor shall keep fuel under lock and key at all times.

If fuel is dispensed from 200 litre drums, the proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism used to dispense fuel from the drums shall be stored in a waterproof container when not in use.

During fuel tanker delivery, the tanker driver must be present at all times during offloading of product. An emergency cut-off switch must be installed to immediately stop fuel delivery should an accident occur. An anti-flash nozzle must be installed at the end of the vent pipe with a fuel dispenser equipped with an automatic cut-off switch to prevent fuel tank overfills.

No smoking shall be allowed in the vicinity of the stores. Symbolic safety signs depicting "No Smoking", "No Naked Lights" and "Danger" are to be provided, and are to conform to the requirement of SABS 1186. The volume capacity of the tank shall be displayed. The product contained within the tank shall be clearly identified using the emergency information system detailed in SABS 0232 part 1. Any electrical or petrol-driven pump shall be equipped and positioned, so as not to cause any danger of ignition of the product.

Areas for storage of fuels and other flammable materials shall comply with standard fire safety regulations and may require the approval of the Municipal Fire Prevention Officer.

The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, vehicles and equipment shall be refuelled at a designated re-fuelling area or at the workshop as applicable. If it is not reasonably practical then the surface under the temporary refuelling area shall be protected against pollution and drip trays used to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall ensure that there is always a supply of appropriate material readily available to absorb / breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 litres of hydrocarbon liquid spill. This material must be approved by the Engineer prior to any refuelling or maintenance activities.

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4.5.3 *Solid Waste Management*

For the purposes of these Environmental Specifications, solid waste includes all debris and waste (e.g. litter, food waste, hardware discards, vegetation and tree stumps, building rubble, etc.), including hazardous waste (e.g. oils) resulting from any construction activities on site.

The Contractor shall be responsible for the establishment of a waste control system (Waste Management Plan) that is acceptable to the Engineer and ECO, and a method statement is required in this regard. The contractor shall keep detailed records of all waste removed from site, together with proof of recycling or legal disposal at a registered landfill site (disposal certificates). No refuse or waste material will be disposed of by burying on site.

Refuse Control

The Contractor shall provide labourers to clean up the Contractor's temporary construction camp and working areas on a daily basis.

Litter and waste materials (excluding rubble and hazardous waste materials) shall be disposed of into scavenger- and weather-proof bins. The Contractor shall provide sufficient bins with lids on site to store the waste produced on a daily basis. In order to facilitate recycling it is recommended that a number of bins be provided at each location, and that such bins be clearly marked according to the category of waste being recycled (e.g. paper, metals, plastics, glass, etc.) Bins shall not be allowed to become overfull and shall be emptied a minimum of once daily. The waste may be temporarily stored on site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved. The Contractor shall then remove the refuse collected from the Site at least once a week. Any refuse not being re-cycled must be disposed of at a registered waste disposal facility.

The Contractor shall ensure that waste and surplus food, food packaging and organic waste are not deposited by employees anywhere on the site except in refuse bins.

Empty Cement Bags

Empty cement bags must be collected from the construction area by the end of every day and before rain events and shall be stored in bins that are either placed under cover or fitted with lids. This prevents the bags getting wet and the cement powder leaching into the environment.

Hazardous Waste

Petroleum, chemicals, and other harmful and hazardous wastes are to be stored in enclosed and bunded areas. The location of these sites is to be

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approved by the Engineer and the ECO. These wastes shall be disposed of at a registered hazardous waste disposal site. The Contractor shall submit copies of receipts from such waste disposal sites to the Engineer and ECO as proof of proper disposal. The storage, handling and disposal of hazardous waste is also controlled through other relevant legislation which must be complied with, e.g. the Occupational Health & Safety Act.

Builders rubble

The Contractor shall provide labourers to clean up the Contractor's camp and working areas of rubble generated in the course of construction work, at least once a week.

Rubble shall be temporarily stockpiled in a waste skip or a central stockpile. Any rubble not being recycled (e.g. sent for crushing) or reused shall be removed from the Site to an approved landfill site as soon as it constitutes a practical load for removal and before temporary closure of the site (e.g. over builders holidays). No plastics, shrink wrap, paint buckets or any other debris that does not constitute clean building rubble, shall be stored at such stockpile sites.

4.5.4 Ablution Facilities

Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the facilities provided. Latrine and ablution facilities and first-aid services shall comply with the regulations of the local authority concerned and shall be maintained in a clean and sanitary condition to the satisfaction of the Engineer.

The Contractor shall provide suitable sanitary arrangements at the Contractor's temporary construction camp and approved points around the designated work area to allow easy access for all employees on the Site. Project staff are not permitted to commence with work on the Site without suitable toilet facilities being available for them.

Sanitary facilities shall be located within 100 m from any point of work, but not closer than 50 m to any water body. One chemical toilet is to be provided on site for every 15 contract personnel at each working area. These toilets must have doors and locks and shall be secured to prevent them blowing over. Toilet paper shall be provided.

The Contractor shall ensure that suitable sanitation facilities are provided for or by all his sub-contractors on the Site.

Toilets are to be emptied prior to builders' holidays. The contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that

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the contents are removed from the Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

The Contractor shall keep the toilets in a clean, neat and hygienic condition. If the Contractor fails to provide and / or maintain all site sanitation facilities in a clean and hygienic condition, the Engineer may order the Contractor to suspend any or all work on the Site until these requirements are met. No payment shall be made for any delays or disruption of the Works caused thereby nor shall extensions of time be granted for such delays.

4.5.5 Eating Areas

The Contractor shall designate eating areas to the approval of the Engineer, which shall be clearly demarcated. Sufficient bins, as specified in 4.5.3, shall be present in this area. Any cooking on site shall be done on well maintained gas cookers with fire extinguishers present.

4.5.6 Drinking Water

The Contractor shall ensure that drinking water is available for all staff on the Site. If no potable water source is available, then the Contractor shall import drinking water to the Site.

4.5.7 Contaminated Water

Potential pollutants of any kind and in any form shall be kept, stored, and used in such a manner that any escape can be contained and the water table not endangered. Water containing such pollutants as cements, concrete, lime, chemicals, fuels and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling. This particularly applies to water emanating from concrete batching plants and concrete swills, and to runoff from fuel depots, workshops and truck washing areas.

Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the Engineer immediately of any pollution incidents on the Site. If construction areas are to be dewatered (e.g. after rains), this water must first be pumped into a settlement area, and not directly into a natural ecosystem.

A Method Statement shall be required for all wash areas where hydrocarbon and hazardous materials or other pollutants are expected to be used. This includes, but is not limited to, vehicle washing, workshop wash bays and paint equipment cleaning. Wash areas for domestic use shall ensure that the disposal of contaminated "grey" water is sanctioned by the Engineer.

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4.5.8 *Hazardous Substances*

Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on the Site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.

If potentially hazardous substances are to be stored on the Site, the Contractor shall provide a Method Statement detailing the substances / materials to be used, together with the storage, handling and disposal procedures of the materials.

No paint products and chemical additives and cleaners such as thinners and turpentine, may be disposed of on the Site. Brush / roller washing facilities shall be established to the satisfaction of the Engineer. A Method Statement, approved by the Engineer, is required for such washing activities.

4.5.9 *Site Structures*

The Contractor shall supply and maintain adequate and suitable sheds for the storage of materials. Sheds for the storage of materials that may deteriorate or corrode if exposed to the weather shall be weatherproof, adequately ventilated and provided with raised floors.

All Site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of the area disturbed. The type and colour of roofing and cladding materials comprising the Contractor's temporary structures shall be selected to reduce reflection. The Contractor's camp shall be fenced with a fence of at least 1.8 m high, and the camp area shall be screened via the attachment of shade cloth to the fence surrounding the site camp.

4.5.10 *Lights*

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area.

4.5.11 *Workshop, Equipment Maintenance and Storage*

Where practical, all maintenance of plant on the Site shall be performed in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities.

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The Contractor shall ensure that in his workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable floor either constructed of concrete or thick plastic covered with sufficient sand to protect the plastic from damage. If constructed of concrete the floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil). A Method Statement detailing the design and construction of the workshop must be submitted.

When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles).

All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or be removed from the Site

The washing of equipment shall be restricted to preventative maintenance requirements only. All washing shall be undertaken in the workshop or maintenance areas, and these areas must be equipped with a suitable impermeable floor and sump / oil trap. The use of detergents for washing shall be restricted to low phosphate and nitrate containing and low sudsing-type detergents.

4.5.12 Noise

The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). When working in any areas within audible distance of residents, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85 dB(A) during excavations and other work.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens.

No amplified music shall be allowed on the Site. The use of radios, tape recorders, compact disc players, television sets, etc., shall not be permitted unless the volume is kept sufficiently low as to avoid any intrusion on members of the public within range. The Contractor shall not use sound amplification equipment on the Site unless in emergency situations.

The Contractor's attention is drawn to the Noise Regulations as promulgated in terms of the Environment Conservation Act and relevant Local Authority bylaws.

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4.5.13 Environmental Awareness Training

Environmental awareness training sessions shall be run for all personnel on the Site. Two types of course shall be run, one for the Contractor's and Subcontractor's management and one for all site staff and labourers. Courses shall be run in the morning during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the Engineer.

All staff are to attend an initial presentation of approximately 45 minutes, and approximately half an hour a month thereafter for the duration of the contract shall be allowed for employees to attend any follow-up lectures, should such follow-up lectures be deemed necessary by the ECO. In addition, all new staff and sub-contractors as well as employees that spend more than one day a week or four days in a month, to attend the environmental education session within one week of commencement of work on site. The Contractor shall supply the ECO with a monthly report indicating the number of employees that will be present on site during the following month and any changes in this number that may occur during the month.

No more than 30 people shall attend each course and the cost, venue and logistics for this/ these course/s shall be for the Developer's responsibility. The ECO shall keep a register of all personnel attending the Environmental awareness training sessions.

Notwithstanding the specific provisions of this clause, it is incumbent upon the Contractor to convey the sentiments of the EMPr to all personnel involved with the works.

Training for management and foremen

The environmental awareness training session for management shall include all management and foremen. The session, which will be presented by the ECO, will be of approximately one-hour duration. The initial session shall be undertaken not less than seven days prior to commencement of work on the Site. Subsequent sessions shall be held as and when required.

Training course for site staff and labour

The environmental awareness training session for the Site staff and labour shall be presented by the ECO. The course will be approximately 45 minutes long. The course shall be run not more than seven days after commencement of work on site with sufficient sessions to accommodate all available personnel. Subsequent sessions shall be held as and when required.

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4.5.14 Contractor's Environmental Officer

The Contractor shall designate a permanent onsite employee as the Environmental Officer who shall be responsible for undertaking a daily Site inspection to monitor compliance with this Specification. The Contractor shall submit the name of the Contractor's Environmental Officer to the Engineer for his approval seven days prior to the date of the environmental awareness training course.

4.5.15 "No go" Areas

The demarcated buffer areas around the heritage sites, pans on the Site and other identified ecological sensitive areas are to be "no go" areas. The Contractor shall ensure that, insofar as he has the authority, no person, machinery, equipment or material enters the "no go" areas at any time.

4.5.16 Construction Personnel Information Posters

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters shall be erected at the eating areas and any other locations specified by the Engineer.

4.5.17 Fire Control

No fires may be lit on the Site. Any fires which occur, shall be reported to the Engineer immediately. Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make viable the rapid spread of an initial flame. In terms of the Atmospheric Pollution Prevention Act, burning is not permitted as a disposal method.

The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedure to be followed. The Contractor shall forward the name of the Fire Officer to the Engineer for his approval seven days prior to the date of the environmental awareness training course.

The Contractor shall ensure that there is basic fire fighting equipment available on Site at all times.

4.5.18 Concrete and Cement Work

Cement powder has a high pH value. Spillage of dry cement powder and concrete slurry will affect both soil and water pH adversely. Careless handling of cement products resulting in spillage can have detrimental effects

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on the surrounding environment.

The location of the batching area (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the Site layout plan and approved by the ECO. A Method Statement indicating the layout and preparation of this facility is required in this regard.

Cement is to be stored in a secure weatherproof location to avoid contamination of the environment.

All runoff from batching areas shall be strictly controlled so that contaminated water does not enter storm water, or groundwater. Plastering boards and mixing trays should be used at all mixing and supply points. Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment.

Suitable screening and containment shall be in place to prevent windblown contamination associated with bulk cement silos, loading and batching.
All visible remains of excess concrete shall be physically removed to an approved Municipal waste site on completion of the plaster or concrete pour section and disposed of.

4.5.19 Emergency Procedures

The Contractor shall submit Method Statements covering the procedures for the following emergencies:

Fire
The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

Accidental leaks and spillages
The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer. In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured.

4.5.20 Safety

The Contractor shall at all times observe proper and adequate safety precautions on the Site. Telephone numbers of emergency services, including

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the local fire fighting service, shall be posted conspicuously in the Contractor's office near the telephone.

No unauthorised firearms are permitted on the Site.

The Occupational Health and Safety Act (No 85 of 1993) and in particular the requirements of the Construction Regulations issued in July 2003, must be complied with.

4.5.21 Security

With the possible exception of any security staff who may be required to be present overnight at the Contractor's temporary construction camp, no personnel will be permitted to live on the Site. Security staff must be provided with heating and cooking facilities (in order that they do not need to light fires), and access to toilet facilities and communication equipment.

Any security lighting at the Contractor's temporary construction camp is to be placed in such a way as to not cause a nuisance to residents of the area and traffic on adjacent roads.

4.5.22 Community Relations

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

All interactions with the surrounding community shall be undertaken in terms of the Community Engagement Plan developed by Solaire Direct in terms of *Section 2.7.8* of this document.

The Contractor shall keep a "Complaints Register" at the Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself. All grievances raised shall be dealt with in accordance with the Solaire Direct Grievance Procedure which is to be developed in accordance with *section 2.7.8* of this document.

4.5.23 Protection of Natural Features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored / rehabilitated to the satisfaction of the Engineer.

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The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams and open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

4.5.24 Protection of Flora and Fauna

Except to the extent necessary for the carrying out of Project work, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted. Trapping, poisoning and / or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on the Site during the construction phase. Where the use of herbicides, pesticides and other poisonous substances has been specified, the Contractor shall submit a Method Statement.

4.5.25 Erosion and Sedimentation Control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and / or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and / or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during the construction period or during the maintenance period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brush-cut packing, mulch or chip cover, straw stabilising (at a rate of one bale / square metre and rotorvated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilized area shall be repaired and maintained to the satisfaction of the Engineer.

4.5.26 Aesthetics

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area.

4.5.27 Dust Control

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer and ECO. Dust control measures may include the stabilization of disturbed

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areas via the rotorvation of straw into the soil surface. In extreme instances, the use of specific dust suppressant additives such as "*Dustex*" may be necessary in order to limit dust generation from haul roads.

During high wind conditions, the Contractor shall comply with the Engineer's instructions regarding dust-suppression measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as wind speeds return to acceptable levels.

4.5.28 Pollution

The Contractor shall take all reasonable measures to minimize any dust nuisance, pollution of streams and inconvenience to or interference with the public (or others) as a result of the execution of the Works. A method statement may be required in this regard as determined by the Engineer and ECO.

If in emergency situations as mentioned above washing of vehicles and machinery is required on site, this should not take place within 50 m from any watercourse. All machinery should be regularly checked for leaks. No runoff shall enter any watercourse.

4.5.29 Working Hours

Working hours in terms of the planning approval shall be adhered to. If works are to take place outside of normal working hours, the ECO and the Engineer are to be notified and disturbance to the surrounding residents or land users is to be prevented. The Engineer will, where required, in turn notify the Local Authority of work done outside of normal working hours.

4.5.30 Excavation and Trenching

During excavation and trenching activities, care is to be taken to ensure that the stockpiling of top material is kept separate from sub-soils. Top material thus saved is to be replaced as top material and is to be the final layer when back-filling. The Contractor shall reinstate all working areas to the satisfaction of the Engineer.

Areas opened for trenching should be restricted to the minimum required to be worked in and closed up in a working day or as dictated by technical requirements such as length of pipe or cable, in order to prevent them from posing safety hazards to people, traffic and animals and to prevent rainwater erosion. Trenches shall be re-filled to the same level as (or slightly higher, to allow for settlement) the surrounding land surface to minimise erosion. Excess soil shall be stockpiled in an appropriate manner. No stockpiling must occur within 50 m of a water course.

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In the event of material removed during trenching being excessive after backfilling or being unsuitable as overburden, the excess material must be removed from the Site to a site agreed upon by the Engineer and, where applicable, the Local Authority

4.5.31 Temporary Site Closure

If the Site is closed for a period exceeding one week, a checklist procedure shall be carried out by the Contractor in consultation with the ECO. Contractor's Safety Officers (in terms of the Occupational Health and Safety Act) are to check the Site and report to the Engineer regarding the following:

Fuels / flammables / hazardous materials stores:

- Ensure fuel stores are as low in volume as possible;
- No leaks;
- Outlet secure / locked;
- Bund empty;
- Fire extinguisher serviced and accessible;
- Secure area from accidental damage, e.g. vehicle collision;
- Emergency and Management telephone numbers to be available and displayed; and
- Adequate ventilation.

Other:

- All trenches and manholes secured;
- Fencing and barriers in place per the Occupational Health and Safety Act (No 85 of 1993);
- Notice boards applicable and secured;
- Security persons briefed and have facility for contact;
- Night hazards checked, e.g. reflectors, lighting, traffic signage;
- Fire hazards identified – local authority notified of any potential threats, e.g. large brush stockpiles, fuels etc.;
- Pipe stockpile wedged / secured;
- Scaffolds secure; and
- Inspection schedule and log by security or contracts staff.

The ECO is to check and report to the Engineer regarding the following issues:

- Wind and dust mitigation in place, e.g. straw, brush packs, irrigation;
- Slopes and stockpiles at stable angle;
- Landscape areas watering schedules and supply secured;
- Fuels / hazardous substances stores secure;

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- Cement and materials stores secured;
- Toilets empty and secured;
- Refuse bins empty and lids secured;
- Bunding clean and treated, e.g. Spill Sorb or Enretech #1 powder;
- Drip trays empty and secure; and
- Structures vulnerable to high winds secure.

The Contractor is to ensure that all temporary closure requirements are met before leaving the Site

4.6 SITE CLEAN UP AND REHABILITATION

4.6.1 Site Clean Up

The Contractor shall ensure that all temporary structures, equipment, materials, waste and facilities used for construction purposes are removed upon completion of the project. Site clean up shall be to the satisfaction of the Engineer and the ECO.

4.6.2 Rehabilitation

Where appropriate, the Contractor shall employ a suitably qualified person (a botanist with experience in restoration of grassland areas) to rehabilitate areas damaged by construction activities during the course of the project. The Contractor shall be responsible for rehabilitating areas identified by the ECO and the Engineer, or recommended by the aforementioned botanist. The Contractor's procedure for rehabilitation shall be approved by the ECO and the Engineer and, where required, the Local Authority's environmental representative.

4.7 TOLERANCES

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.
It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a fine subject to the details set out in the Environmental Specification.

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4.8 MEASUREMENT AND PAYMENT

4.8.1 Basic Principles

Except as noted below and as per the Scheduled Items, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items as contained in the Schedule of Quantities, as completed by the Contractor when submitting his tender.

Some of the important cost items have been listed below to assist the Contractor in making provision for implementation of the Specifications:

a) Protection of stock piles from blowing or washing away: The spraying or covering of stockpiles, including the supply of the spray or cover material or vegetation, as required.

b) Storage of fuel and oils: The supply, construction, installation, transport, upkeep and removal of all facilities required for storage and management of fuel and oils.

c) Cement-laden water management: The supply, construction, installation, transport, upkeep and removal of all facilities required for the management of wastewater from concrete operations.

d) Contaminated water management: The supply, construction, installation, transport, upkeep and removal of all facilities required for managing contaminated water.

e) Storm water and flood management: The supply, construction, installation, transport, upkeep and removal of all facilities required for managing storm water run-off from the site and protection of works from flooding.

f) Bunding and management of run-off from workshop areas and supply of drip trays for stationary and "parked" plant: The supply, construction, installation, transport, upkeep and removal of all facilities required for bunding and managing the run-off from workshop areas as well as all drip trays required.

g) Dust management: The supply, application, transport, upkeep and removal of all materials required to ensure that dust is adequately controlled.

h) Solid waste management: The supply, application, transport, upkeep and removal of all materials required to ensure that solid waste is adequately controlled in accordance with the specification (including the recycling program).

i) Fire Control: The supply, transport, upkeep and removal of all material required for fire control.

j) Eating areas: The supply, construction, installation, transport, upkeep and removal at the end of the construction of all eating areas structures.

k) Ablutions: The supply, maintenance, regular emptying and removal of toilets.

l) Site demarcation: The supply, installation and removal at the end of the construction of all temporary fences.

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m) Vegetation protection: The supply, installation and removal at the end of the construction of all vegetation protection fences.

4.8.2 Scheduled Items

a) Provision of venue and staff attendance at the environmental awareness training courses:

The provision of a venue and attendance at the environmental training courses will be measured as a lump sum. The sum shall cover all costs incurred by the Contractor in providing the venue and facilities and in ensuring the attendance of all relevant employees and sub-contractors at the training.

b) Method Statements: Additional Work:

No separate measurement and payment will be made for the provision of Method Statements where the Engineer requires a change on the basis of his opinion that the proposal may result in, or carry a greater than warranted risk of, damage to the environment, in excess of that warranted by the Specifications. In cases of additional work being required, provided it could not reasonably have been foreseen by an experienced contractor, it shall be valued in accordance with GCC 90 Clause 40.

A stated sum is provided in the Schedule of Quantities to cover payment for such additional work.

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In order to ensure compliance with environmental legislation requirements and NEMA best practise, the following actions are applicable to the construction phase and are the responsibility of Solaire Direct. Standard construction phase compliance standards that need to be implemented by the Contractor are contained in section 4.

CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
1.	Compliance with EMPr and EA	Confirm Solaire Direct commitment to adherence to EMPr and Contractor Compliance Standards	1.1	Ensure that the EMPr, Contractor Compliance Standards and EA are available at the site throughout construction and implemented by the contactor.	Copy of signed EMPr and EA with subcontractor	Solaire Direct	Prior to construction
		Auditing of compliance with EMPr and EA	1.2	An audit report must be undertaken by an independent auditor at the end of the construction phase, and shall be submitted to DEA.	Audit report and proof of submission to DEA	Solaire Direct	End of Construction
			1.3	The audit report shall indicate the date of the audit, name of auditor, and outcome of audit in terms of compliance with the environmental authorisation and conditions of the EMPr.			
2.	Health and Safety	Ensure the health and safety of subcontractors and site users	2.1	A Health and Safety Plan must be developed prior to the commencement of construction to identify and avoid work related accidents. This plan must be adhered to by the appointed construction contractors and meet Occupational Health and Safety Act (No 85 of 1993), requirements.	Signed Health and Safety Plan	Solaire Direct	During construction
			2.2	Appropriate Personal Protective Equipment (PPE) must be worn by all construction personnel. This shall include the use of ear protection in areas where the 8-hour ambient noise levels exceed 75dBA.	Signed Health and Safety Plan		
3.	Dust and emissions	Limit fugitive dust and exhaust emissions	3.1	Dust abatement should be implemented especially during windy conditions and in areas prone to generation of airborne dust. This shall include covering of stockpiled and transported materials.	ECO records	Solaire Direct	During construction
			3.2	Vehicles travelling on unpaved or gravel roads must not exceed a speed of 30 km / hr.	Grievance Procedure documentation / logbook		
			3.3	Stockpiles of dusty materials must be enclosed or covered by suitable shade cloth or netting to prevent escape of dust during loading and transfer from site.			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			3.4	All directly affected and neighbouring farmers must be able to lodge grievances with Solaire Direct using the Grievance Procedure (included in the EMPr) regarding dust emissions that could be linked to the project.			
			3.5	Solaire Direct Project Manager to keep records of any complaints regarding dust and emissions.			
			3.6	Vehicles are to be kept in good working order and serviced regularly to minimise emissions.			
4.	Noise pollution	Avoid disturbing surrounding land-users	4.1	Vehicles must to adhere to speed limits on site, and not exceed 30km / hr	Signage on site	Solaire Direct	During construction
			4.2	Mechanical equipment with lower sound power levels would be selected to ensure that the permissible occupation noise-rating limit of 75 dBA is not exceeded. Construction workers and personnel would wear hearing protection when required.			
			4.3	Vehicles and machines will be properly serviced and well maintained.			
			4.4	A grievance procedure will be established whereby complaints are recorded and responded to.	Grievance logbook		
5.	Traffic Impact	Mitigate traffic impacts	5.1	The Traffic Management Plan will be adhered to including adherence to speed limits and 'rules of the road'.	Traffic Management Plan	Solaire Direct	During construction
			5.2	All directly affected and neighbouring farmers and local residents will be able to lodge grievances with Solaire Direct using the Grievance Procedure regarding dangerous driving or other traffic violations that could be linked to the Project.	Grievance Procedure		
			5.3	Impacts associated with the higher traffic volumes can be accommodated by proper site management, by controlling the size of orders that would be transported to the site at any given time and by notifying the public through local and regional media centres when large freight-carrying vehicles will be on the roads.	Permit if required	Solaire Direct / Appointed rep	
			5.4	During construction, arrangements and routes for abnormal			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				loads (if required) will be agreed in advanced with the relevant authorities and the appropriate permit will be obtained for the use of public roads			
			5.5	Liaison will take place with Transnet to mitigate or minimise disturbance or impacts to the railway line.			
6.	Damage or Destruction of Cultural Heritage Interests (Palaeontology, Archaeology and Cultural Heritage)	Minimise damage to cultural heritage interests	6.1	If any human remains are uncovered during the construction of the site, work should stop in that area and ECPHRA and the SAHRA Burials Unit should be notified. They will investigate and propose a way forward.	ECO Report & ECPHRA / SAHRA response	Solaire Direct	Prior to and throughout construction
			6.2	All directly affected and neighbouring farmers will be able to lodge grievances with Solaire Direct using the Grievance Procedure.	Grievance procedure and logbook		
			6.3	The ECO responsible for the Development must remain aware that all sedimentary deposits have the potential to contain fossils and he / she should thus monitor all substantial excavations into sedimentary bedrock for fossil remains. If any fossils are found during construction, ECPHRA and SAHRA should be notified immediately.	ECO Report & ECPHRA / SAHRA response		
			6.4	Avoid construction (including access roads, underground cabling and power lines) within buffer zones surrounding the ecologically sensitive drainage lines and Kraal and Grave sites in the Project area.	Site inspection		
			6.5	If significant fossils are found, an appropriately qualified palaeontological specialist will investigate, and if required, a permit will be obtained to recover and preserve the paleontological resources for scientific purposes before work can be commenced again	Site inspection		
			6.6	Should any archaeological materials (artefacts; cultural material such as historic glass, ceramics, etc; sub-surface structures, etc) be uncovered or exposed during earthworks or excavations, they will immediately be reported to the South African Heritage Resources Agency (SAHRA). After assessment, and if appropriate, a permit will be obtained from SAHRA or ECPHRA to remove such remains.	ECO Report & ECPHRA / SAHRA response		

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
7.	Waste and Effluent	Minimise Waste and Effluent	7.1	Temporary waste storage area to be weather proof to prevent dispersion of waste through e.g. wind or rain.	Visual Inspection	Solaire Direct / Appointed rep As arranged by Solaire Direct	Throughout construction and operation
			7.2	Emptying of waste disposal containers.			
			7.3	Construction waste management will be governed by this CEMPr and will incorporate reduction, recycling and re-use principles.			
			7.4	Material Safety Data Sheets for all applicable materials present on the Site will be readily available to on-site personnel.			
			7.5	All wastes produced from project activities on site will be transferred to designated temporary storage areas and where possible into secure containers.			
			7.6	Solid wastes will be segregated to facilitate reuse and recycling of specific materials.			
			7.7	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.			
			7.8	Indigenous vegetative material will be kept on the Site and mulched after construction to be spread over the disturbed areas to enhance rehabilitation of the natural vegetation.			
			7.9	Effluent from the washing-down of concrete mixing and handling equipment will be contained within a bunded area of 110 percent capacity of the stored material. This effluent will then be treated as hazardous waste and disposed of by a licensed contractor.			
			7.10	All hazardous and liquid waste materials, e.g. fuel for generators, including any contaminated soils will be stored in a bunded area of 110 percent of the stored material's capacity and disposed of by a licensed contractor.			
			7.11	Fuels on site will be stored in a locked container within a fenced and secure temporary staging area.			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			7.12	Trucks and construction vehicles will be serviced off-site.			
			7.13	Effluent and stormwater run-off will be discharged away from any identified drainage lines.			
			7.14	All concrete mixing will be undertaken on impermeable plastic lining to prevent contamination of the soils and surrounding areas.			
			7.15	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.			
			7.16	The construction contractor will remove refuse collected from the designated waste storage areas at the Site at least once a week.			
			7.17	All rubble generated during the construction phase will be removed from the Site regularly to a licensed landfill site.			
8.	Faunal Impacts	Mitigate impacts on fauna	8.1	Poaching or hunting is strictly forbidden and poaching should be controlled by banning dogs on the Site and enclosing worker compounds.	ECO Report and photographic evidence	Solaire Direct	During construction
			8.2	Fauna must have 'right of way' on internal roads. Slow moving animals such as tortoises which may be in the way, should be placed at the side of the road in the direction the animal was seen travelling.	Road signage and ECO reports and grievance logs		
			8.3	The collection, hunting or harvesting of any animals at the Site is strictly forbidden. Any personnel found collecting, hunting or harvesting of any animals will be removed from the Project permanently and removed from the Site immediately. Solaire Direct will develop and implement a disciplinary procedure for staff who are caught conducting such activities.	Worker training and awareness records		
			8.4	All vehicles must abide by designated and prepared internal roads and a speed limit of 30 km/hr must be enforced.	ECO Report		
			8.5	It should be mandatory for staff of Solaire Direct to attend an environmental briefing and training session with respect to the	Worker training & awareness records		

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				guidelines outlined in this EMPr.			
			8.6	Any fauna directly threatened by the construction activities will be removed to a safe location by the Environmental Control Officer (ECO). This must be supervised by an appropriately qualified ecological specialist.	ECO Report		
			8.7	Fires should only be allowed within fire-safe demarcated areas.	Site inspection		
			8.8	No fuel wood collection should be allowed on-site.	Site inspection		
			8.9	All hazardous materials will be stored in the appropriate manner to prevent contamination of the Site. Any accidental chemical, fuel and oil spills that occur at the Site will be cleaned up in a manner appropriate to the nature of the spill..	ECO Report		
			8.10	All fuels and oils will be stored in bunds of 110 percent of tank capacity.	ECO Report		
			8.11	No unauthorized persons will be allowed onto the Site.	ECO Report		
			8.12	Personnel will not be allowed to traverse areas other than the Site	ECO Report		
			8.13	No dogs will be allowed on the Site.	ECO Report		
			8.14	In terms of site fencing, provision will be made for faunal access, at least at strategic sites such as where drainage lines enter or leave the Site.	ECO Report		
9.	Avifauna Impacts	Minimise avifauna impacts	9.1	Any new powerlines required as part of the Development will be aligned with existing powerlines where possible.	ECO Report, visual inspection and logbook	Solaire Direct	Throughout construction
			9.2	All new powerlines will be marked with bird flight diverters.			
			9.3	All new powerline infrastructure will be bird-friendly in configuration and adequately insulated with maximum air gaps between all live components, and minimum opportunity for birds to nest, roost or perch in close proximity to any live components. These activities will be supervised by an appropriately qualified ecologist or ornithologist with experience in this field.			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
10.	Visual Impacts	Minimise visual impacts	10.1	Measures to control wastes and litter should be included in the contract specification documents.	Evidence in contract specification documents.	Solaire Direct	Throughout construction
			10.2	The temporary construction camp, material stores and lay-down area should be screened as far as possible from the local roads.			
			10.3	The construction camp, material stores and lay-down area should be kept tidy.	ECO Report		
			10.4	The extent of the temporary construction camp and stores should be limited in area to only that which is essential.			
			10.5	Provision should be made for rehabilitation/ re-vegetation of areas damaged by construction activities, according to the botanist's recommendations or this EMPr.			
			10.6	Disturbed areas rather than pristine or intact landscape areas should preferably be used for the temporary construction camp.			
			10.7	Borrow pits for the construction purposes are assumed to be from local approved sites. New borrow pits would be subject to permits from the relevant authorities, and should preferably not be visible from the N10.			
			10.8	The construction area should be cordoned off to avoid unnecessary damage to the surrounding veld, and penalties applied for unauthorised disturbance or damage.	ECO Report		
11.	Impacts on Surface Water and Groundwater:	Minimize Impacts on Surface Water and Groundwater:	11.1	All hazardous materials will be stored in the appropriate manner to prevent contamination of the site. Fuel, oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material	Visual Inspection	Solaire Direct	Throughout construction
			11.2	Any accidental chemical, fuel and oil spills that occur at the Site will be cleaned up in the appropriate manner as related to the nature of the spill. Spill containment and clean up kits should be available onsite and clean-up from any spill should be appropriately contained and disposed of.			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			11.3	Construction vehicles and equipment will be serviced regularly.			
			11.4	Construction vehicles and equipment will be serviced off site.			
12.	Loss and Disturbance of Sensitive Plant Communities:	Minimize the Loss and Disturbance of Sensitive Plant Communities:	12.1	Vegetation clearing to be kept to a minimum.	Visual Inspection and ECO Report	Solaire Direct	Throughout construction
			12.2	All areas to be cleared should be clearly demarcated.			
			12.3	Sensitive areas as demarcated on the sensitivity map should be avoided, and where such areas occur within or near the PV Footprint, they should be clearly demarcated as no-go areas.			
			12.4	Educate all contractors as to the importance of the undisturbed conservations areas and prohibitions on fires and collection of plant material.			
			12.5	Contractors are to use existing farm tracks as far as possible. If vehicles must leave the road, they should utilize a single track and should not take multiple paths.			
			12.6	If topsoil must be removed, it should be replaced or used as soon as possible elsewhere as it will contain seed of local species which will aid the natural recovery of the vegetation.			
			12.7	The final PV Footprint will be surveyed for species suitable for search and rescue prior to the commencement of construction by a suitably qualified ecologist or botanist.			
			12.8	Erosion control measures will be implemented in areas where slopes have been disturbed.			
			12.9	Re-vegetation of cleared areas will be undertaken to ensure that recovery is taking place.			
13.	Loss of Topsoil, Soil Compaction and Soil Erosion	Minimize the Loss of Topsoil, Soil Compaction and Soil Erosion	13.1	Protect disturbed surfaces against erosion.	Visual Inspection and ECO Report	Solaire Direct	Throughout construction
			13.2	Build regular diversion berms in gravel compacted roads.			
			13.3	Restrict removal of vegetation and soil cover to those areas necessary for the Development.			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			13.4	Implement soil conservation measures such as stockpiling topsoil or gravel for remediation of disturbed areas.			
			13.5	Stockpiles should be vegetated or appropriately covered to reduce soil loss as a result of wind or water erosion.			
			13.6	Disturbed areas will be rehabilitated as soon as possible to prevent erosion.			
			13.7	Work areas should be clearly defined and demarcated, where necessary, to avoid unnecessary disturbance or areas outside the PV Footprint.			
			13.8	Fuel, oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.			
			13.9	Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of.			
			13.10	Construction vehicles and equipment will be serviced regularly.			
			13.11	Construction vehicles and equipment will be serviced off site.			
			13.12	Construction vehicles will remain on designated and prepared compacted gravel roads.			
14.	Loss of Vegetation and increased alien plant invasion	Minimize the invasion of Alien Plants	14.1	Soil disturbance and vegetation clearing should be kept to a minimum.	ECO Report	Solaire Direct	Throughout construction
			14.2	Cleared areas that are not going to be used should be re-vegetated with locally collected seeds of indigenous species.			
			14.3	Regular monitoring to ensure that alien plants are not increasing as a result of disturbance that has taken place.			
			14.4	The PV Footprint will be surveyed for species suitable for search and rescue prior to the commencement of construction by a suitably qualified ecologist or botanist.			
			14.5	Ecologically sensitive areas near the PV Footprint should be			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				clearly demarcated as no-go areas.			
			14.6	Vegetation clearing will be kept to a minimum. No unnecessary vegetation will be cleared.			
			14.7	Erosion control measures will be implemented in areas where slopes have been disturbed.			
15.	Loss of Landscape Connectivity	Minimizing the impacts of the loss of landscape connectivity	15.1	Fencing should be constructed in a manner which allows for the passage of small and medium sized mammals. Steel palisade fencing (20 cm gaps min) is a good option in this regard as it allows most medium-sized mammals to pass between the bars, but remains an effective obstacle for humans. Alternatively the lowest strand or bottom of the fence should be elevated to 15 cm above the ground at least at strategic places to allow for fauna to pass under the fence.	ECO Report	Solaire Direct	Throughout construction
			15.2	If electrified strands are to be used, there should be no strands within 30 cm of the ground because tortoises retreat into their shells when electrocuted and eventually succumb from repeated shocks.			
16.	Impact on Agricultural Activities	Minimize the Impact on Agricultural Activities	16.1	Solaire Direct will minimise the damage to farmland caused by construction activities by ensuring strict compliance with construction plans to minimise the PV Footprint and to implement a 'Code of Conduct' governing workers.	ECO Report	Solaire Direct	Throughout construction
			16.2	Solaire Direct will design the infrastructure layout in a manner that limits the PV Footprint of the facility and all associated infrastructure.			
			16.3	Solaire Direct will not actively seek workers who are employed on the Drennan farm, or surrounding farms.			
			16.4	Solaire Direct will assist farmers in explaining to their staff that employment on the Project would be temporary, and should not be seen as an alternative to existing employment.			
			16.5	Solaire Direct will ensure that wages paid on the Project are the equivalent to those paid in the area for work of a similar nature.			
			16.6	Any damage to vegetation would be rehabilitated in accordance			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				with mitigation proposed for the rehabilitation of natural vegetation.			
			16.7	A designated area must be established for welding, cutting and any other "hot-work" and such work must be limited (as far as possible) to this area.			
			16.8	An Emergency Procedure will be developed and communicated to all surrounding landowners, workers and other relevant stakeholders. All appropriate equipment for managing fires and other emergencies will be stored on site and properly maintained.			
			16.9	The contractor must ensure that a contact list for all neighbouring landowners is available on site so that all neighbours can be contacted in the event of a fire.			
			16.10	A firebreak must be established around the PV Footprint prior to the commencement of construction and must be maintained throughout the operation phase of the PV Power Facility.			
			16.11	In the event that heavy rains are expected, construction activities will be put on hold to reduce the risk of erosion.			
			16.12	If additional earthworks are required, any steep or large embankments that are expected to be exposed during the rain months will be armoured with fascine-like structures.			
			16.13	If earth works are required, then storm water control and wind screening will be undertaken to prevent soil loss from the site.			
17.	Employment Creation	Enhance local employment opportunities	17.1	The labour contract between Solaire Direct and Subcontractors who are appointed to provide services during the construction phase of the Project will specify local labour employment criteria, e.g. percentage of total workforce.	Procurement and Recruitment Policy	Solaire Direct	Throughout construction
			17.2	Solaire Direct will develop a Procurement and Recruitment Policy which sets reasonable targets for the employment of South African and local residents /suppliers (originating from the local municipality) and promote the employment of women as a means of ensuring that gender equality is attained. Criteria must be set for prioritising, where possible, local (local			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				municipal) residents / suppliers over regional or national people / suppliers.			
			17.3	No employment will take place at the entrance to the Site. Only formal channels for employment will be used.			
18.	Social Ills Linked to Influx of Job Seekers	Minimize social ills	18.1	Solaire Direct and its appointed contractors will develop an induction programme, including a Code of Conduct, for all workers (including contractors and their workers). A copy of the Code of Conduct to be presented to all workers and signed by each person.	Code of Conduct	Solaire Direct	Throughout construction and operation
			18.2	The Code of Conduct will address the following aspects: • respect for local residents; • respect for farm infrastructure and agricultural activities; • no hunting or unauthorised taking of products or livestock; • zero tolerance of illegal activities by construction personnel including: prostitution; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or violent behaviour; • compliance with the Traffic Management Plan and all road regulations; and • description of disciplinary measures for infringement of the Code of Conduct and company rules.			
			18.3	If workers are found to be in contravention of the Code of Conduct, which they will have signed at the commencement of their contract, they will face disciplinary procedures that could result in dismissal. Stock theft should be noted as a dismissible offence.			
			18.4	Solaire Direct must develop and implement a grievance procedure that is easily accessible to local communities, through which complaints related to contractor or employee behaviour can be lodged and responded to. Solaire Direct must respond directly to such complaints. Key steps of the grievance mechanism include: • circulation of contact details of 'grievance officer' or other key Solaire Direct contacts; • awareness raising among local communities (including all directly affected and neighbouring farmers) regarding the	Grievance procedure and logbook		

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				grievance procedure and how it works; and • establishment of a grievance register to be updated by Solaire Direct, which should include all responses and response times.			
			18.5	Solaire Direct, together with the appointed contractors must develop a means of monitoring access to the Site, prohibiting unauthorised access to the site and ensuring that all visitors report to the Site office.	Eco Report		
			18.6	No employment will take place at the entrance to the Site. Only formal channels for employment will be used.	ECO Report		
			18.7	Solaire Direct will award a contract to an appropriate security company, to provide 24hr security at the Site. The security company will comply with the above mentioned Code of Conduct.	Security documentation		
			18.8	Solaire Direct must develop and implement an HIV/AIDS policy and information document for all workers directly related to the project. All contractors must implement this policy. The information document will address factual health issues as well as behaviour change issues around the transmission and infection of HIV/AIDS. Solaire Direct will make condoms available to employees and all contractor workers.	HIV/AIDS Policy		
			18.9	The construction workers (from outside the area) should be allowed to return home over the weekends or on a regular basis to visit their families and the contractor should make the necessary arrangement to facilitate these visits.			
19.	Unmet Stakeholder Expectation	Set realistic Expectations	19.1	Solaire Direct will undertake clear communication with all stakeholders regarding realistic employment opportunities .	Grievance procedure and logbook	Solaire Direct	Throughout construction
20.	Inflation and Increased Cost of Living	Mitigate against inflation and increased cost of living in the affected project area	20.1	Mitigation measures regarding the employment procedures and communication of opportunities will serve to reduce the influx of job-seekers.	Grievance procedure, local accommodation census	Solaire Direct	Throughout construction
			20.2	Solaire Direct will develop and implement a grievance procedure that is easily accessible to local communities, through which complaints related to contractor or employee			

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CONSTRUCTION PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				behaviour can be lodged and responded to. Solaire Direct must respond directly to such complaints. Key steps of the grievance mechanism include: • circulation of contact details of 'grievance officer' or other key Solaire Direct contacts; • awareness raising among local communities (including all directly affected and neighbouring farmers) regarding the grievance procedure and how it works; and • establishment of a grievance register to be updated by Solaire Direct, which should include all responses and response times.			
			20.3	Solaire Direct will conduct a census of local accommodation options to ensure that the accommodation requirements can be met. Solaire Direct should work with the Local Municipality to address accommodation shortages should this be the case.			

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5 OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME (OEMPR)

5.1 SCOPE

This Specification covers the requirements for controlling the impact on the environment of operational activities.

5.2 AIM AND PURPOSE OF THE OEMPR

This Operational Environmental Management Programme (OEMPr) aims to provide Solaire Direct with the necessary tools to ensure that the potential impacts on the environment during the operation of the Project are minimised. Moreover, it aims to ensure that the infrastructure is operated and maintained according to Best Practice. The OEMPr aims to ensure that the Project is maintained and operated in an environmentally sensitive and sustainable manner, and that the operation of the Project does not result in reasonably avoidable environmental impacts.

The OEMPr is a working document that may be amended to enhance its effectiveness for environmental control. Therefore, not all specifications and details are prescribed here but should be discussed and the best possible practicable application made by the responsible parties.

5.3 APPLICATION

The application and implementation of the OEMPr shall be the responsibility of Solaire Direct. Solaire Direct is to appoint an Environmental Site Manager (ESM) to ensure that relevant requirements of the OEMPr document are implemented, and that the Site is suitably managed. Solaire Direct may appoint a suitably qualified and experienced person from within the existing staff to fulfil the role of ESM. Solaire Direct may also form an Environmental Liaison Committee (ELC) to facilitate the implementation of the OEMPr. If the ELC is formed, many of the responsibilities of Solaire Direct may be delegated to the ELC. The ELC should consist of at the very least the following:

- Representative of Solaire Direct;
- Environmental Site Manager; and
- Representative of the local authority.

Other members may include an independent environmental control officer or representatives from community based organisations or environmental groups.

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Should Solaire Direct sub-contract the running of the solar farm to a third party, the OEMPr must be part of the contract and must be binding.
The roles and responsibilities of each of the above-mentioned environmental management bodies have been detailed below:

5.3.1 *Environmental Liaison Committee (ELC)*

The ELC is a representative body of various key role players involved in Project and environment-related organisations, which have a particular interest in the Drennan Project. Members of this committee will not remain constant, and may vary over time.

The ELC will play an advisory role, and provide a forum for democratic decisions regarding OEMPr implementation during the operational phase of the Project t, as well as periodically reviewing the OEMPr in terms of its applicability to management requirements on site. They are to meet periodically to receive a report back on environmental management. This frequency may need to be reviewed following the first year of operation, but should not be less than twice a year.

All members of the ELC will be expected to attend the meetings, and are to provide the chairperson of the committee with a written apology if unable to attend. In such a case, the member will receive minutes of the meeting, and may be expected to respond to certain issues.

5.3.2 *Solaire Direct*

The implementation of the OEMPr, as well as the adherence to any conditions within the Environmental Authorization relating to the operational phase of the Project, shall be the responsibility of Solaire Direct. Solaire Direct will appoint an Environmental Site Manager and various specialists as required to ensure that the specifications of this document as they relate to general Site management and maintenance, as well as environmental audits, are suitably implemented on the Site.

5.3.3 *Environmental Site Manager (ESM)*

A suitably qualified and trained individual appointed by Solaire Direct prior to the operation of the Solar PV Facility, will fulfil the role of the Environmental Site Manager. The primary roles and responsibilities of the ESM will be:

- to oversee the implementation of the EMP on the Site;
- to visit the Site on a monthly basis and advise on areas of environmental management, or compliance with the OEMPr, requiring attention;

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- to visit the Site more regularly during the first three months of operation, during which more frequent monitoring may be required for the establishment of certain programmes or aspects of environmental management;

- to be called to the Site in the case of any emergency situation which may impact on the local environment;

- to liaise with various specialists and the local authorities if required, regarding issues relating to environmental management;

- to report on compliance with the OEMPr specifications to the ELC / Solaire Direct;

- to facilitate environmental audits and ensure that they are undertaken, as required;

- to keep a comprehensive record of environmental management, issues of non-compliance and minutes of ELC meetings for audit purposes; and

- to undertake any other tasks outlined in this document, on the behalf of Solaire Direct.

5.3.4 Independent Environmental Control Officer (ECO)

Since provision has been made for the ESM to be an internal Solaire Direct appointment, Solaire Direct must employ an independent Environmental Professional with a post graduate degree in environmental studies and a minimum of five years relevant experience to act as the independent environmental auditor for the Site. The ECO is to be employed upon completion of the first year of operation, and is to perform an annual formal audit on the management plan, and its implementation by the relevant parties for the duration for the operational phase of the Project. Specific audit requirements are contained within *Section 5.6.5*.

5.4 FINANCING FOR ENVIRONMENTAL MANAGEMENT

The budget for the implementation of the OEMPr shall come out of Solaire Direct's operational budget. Solaire Direct must review the OEMPr and allocate the requisite funds to facilitate compliance. Since many of the items addressed in the OEMPr relate to required preventative maintenance, operator legal compliance, and responsible environmental management, this cost should not represent significant additional expenditure.

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5.5 SUMMARY OF OPERATIONAL ENVIRONMENTAL SPECIFICATIONS

In this section of the document, specifications for environmental management on site have been summarized, to facilitate easy reference and implementation.

This section clearly lays out the management requirements, who is responsible for undertaking the required actions, time frames within which they are required, as well as requirements for monitoring, or where applicable, approval of the required action. Relevant references to these details have been provided in the tables below.

Where Solaire Direct has been identified as the responsible party, this should be read as Solaire Direct, or a suitable individual / organisation employed by them to undertake such task. Where another party has been identified as responsible for undertaking a management action, they are to fulfil this requirement, although Solaire Direct will ultimately be held responsible for any requirements or specifications of this document which are not fulfilled. Solaire Direct holds the responsibility of ensuring that the action is undertaken according to the specifications of this document

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In order to ensure compliance with environmental legislation requirements and recommendations specified, the following generic and specific requirements are applicable during the operational phase of the Drennan PV Power Facility.

OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
1.	Visual impacts	Minimize the visual impacts during the operation phase.	1.1	Signage related to the PV power facility must be discrete and confined to entrance gates. No advertising will be permitted.	Photographic evidence and ECO Report	Solaire Direct	Throughout operation
			1.2	The PV Footprint, (facilities, as well as parking and vehicular circulation), should be clearly defined.			
			1.3	The operations and maintenance areas should be screened by buildings, walls or tree planting where possible, and should be kept in a tidy state to minimise further visual impact.			
2.	Health and Safety	Maintain health and safety standards	2	Regular maintenance of Project infrastructure, cables and buildings must be undertaken to ensure optimal functioning.	Inspection records	Solaire Direct	Throughout operation
3.	Dust and emissions	Prevention of excessive dust generation	3	Solaire Direct to ensure that vehicles related to the Solar PV Facility travelling on gravel roads should not exceed a speed of 30 km/h. Solaire Direct to erect signage and undertake driver education in this regard.	Signage/ Visual monitoring	Solaire Direct/ ESM	Throughout operation
4.	Waste and Effluent	Prevent soil and groundwater pollution	4.1	Used oil stored on the Site must be stored in an impervious container, within a bunded area.	Photographic evidence	Solaire Direct	Throughout operation
			4.2	Designated waste bins will be provided and regularly emptied at the municipal waste disposal facility.	Waste manifest documents		
			4.3	Areas disturbed during construction will be re-vegetated with indigenous vegetation to prevent erosion.	Photographic evidence		
			4.4	Operation waste management will be governed by this OEMPr and will incorporate reduction, recycling and re-use principles.			
			4.5	Material Safety Data Sheets for all applicable materials present on the Site will be readily available to on-site personnel.	ECO Report		
			4.6	Solid wastes will be segregated to facilitate reuse and recycling of specific materials.			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			4.7	All wastes produced from Project activities the Site will be transferred to designated temporary storage areas and where possible into secure containers such as waste bins.			
			4.8	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.			
5.	Recycling	Recycle as much waste as feasibly possible	5.1	Recycling programme to be established on the Site. To include cardboard, glass, plastic, paper and metals	Visual inspection	Solaire Direct / Appointed rep	Within first 3 months of operation
			5.2	Separation / deposition of suitable materials in recycling containers	Visual inspection, random monthly checks on recycling waste storage area	Solaire Direct / Appointed rep Contracted cleaning service	On-going
			5.3	Emptying of recycling containers	Visual inspection	Recycling companies / Waste Contractor, as arranged by Solaire Direct	As required –Solaire Direct / ELC to determine frequency
6.	Traffic	Minimise traffic impacts	6.1	All internal and access roads that will be used by Solaire Direct during the operational phase of the Project will be maintained by Solaire Direct throughout the life of the Project.	Photographic evidence	Solaire Direct	Throughout operation
			6.2	During operation, if abnormal loads are required for maintenance, the appropriate arrangements will be made to obtain the necessary transportation permits and the route agreed with the relevant authorities to minimise the impact of other road users.	Permit if required	Solaire Direct / Appointed rep	
			6..3	Liaison will take place with Transnet to mitigate or minimise disturbance or impacts to the railway line.			
7.	Loss of Topsoil, Erosion Management and Soil Degradation	Minimise erosion and soil degradation	7.1	Bi-annual monitoring of erosion in the vicinity of the roads, PV arrays, buildings and other hard-standing surfaces to be conducted to ensure erosion sites can be identified early and	Visual inspection for erosion	ESM	Before and after the rainy season

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				remedied.			
			7.2	Determine the cause of erosion where it occurs. Implementation of suitable repair and mitigation.	ECO Report, Visual inspection of mitigation measures to ensure that they are preventing further erosion.	ESM Solaire Direct / Appointed rep, ESM	As required Within a month following request for mitigation by ESM
			7.3	All hazardous materials will be stored in the appropriate manner to prevent contamination of the Site. The storage area needs to be bunded with a capacity of 110 percent of the tank volume; tanks and associated infrastructure need to be inspected regularly.	ECO Report		
			7.4	Any accidental chemical, fuel and oil spills that occur at the Site will be cleaned up in the appropriate manner as related to the nature of the spill.	ECO Report		
			7.5	Regular monitoring will be undertaken for erosion to ensure that no erosion problems are occurring at the Site as a result of the roads and other infrastructure. All erosion problems observed will be rectified as soon as possible.	ECO Report		
			7.6	All maintenance vehicles to remain on the demarcated roads.	Site inspection, ECO Report		
			7.7	Laydown or infrastructure assembly areas not required during the operational phase of the PV power facility will be re-vegetated with indigenous vegetation to prevent erosion.	ECO Report		
8.	Loss of Vegetation and increased alien plant invasion	Minimise impacts associated with loss of vegetation and minimize the invasion of alien plants.	8.1	Vegetation that needs to be reduced in height should be mowed or brush-cut to an acceptable height, and not to ground level except where necessary.	Photographic evidence and ECO Report	Solaire Direct	Biannually
			8.2	On-site employees and visitors to the Site will be educated about the conservation of vegetation. This will include strict guidelines for remaining on existing roads while on site to avoid unnecessary destruction or damage to undisturbed and rehabilitated vegetation.			
			8.3	Workers are to use existing farm tracks as far as possible. If vehicles must leave the road, they should utilize a single track and should not take multiple paths.			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			8.4	When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.			
			8.5	All alien plants present at the Site should be controlled annually using the best practice methods for the species present.			
			8.6	Bare soil should be kept to a minimum, and at least some grass or low shrub cover should be encouraged under the panels.			
			8.7	Any vegetation clearing that needs to take place as part of maintenance activities, should be done in an environmentally friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.			
			8.8	Document pre- and post- construction vegetation cover and recovery of the ground layer.			
			8.9	Monitor alien plant abundance within the Development areas, as well as in the surrounding area, on at least a bi-annual basis.			
			8.10	Document erosion problems and the control measures implemented.			
			8.11	Document re-vegetation actions taken and their success.			
			8.12	The collection or harvesting of any plants at the Site will be strictly forbidden throughout all phases of the project. Solaire Direct will develop and implement a disciplinary procedure for personnel who are caught conducting such activities.			
			8.13	Any cleared areas which do not have some vegetation cover to protect the soil will be re-vegetated with locally occurring species and monitored to ensure recovery is taking place.			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			8.14	Regular alien clearing will be conducted using good-practice methods for the species concerned. The use of herbicides will be avoided as far as possible.			
9.	Fauna	Minimise impacts to fauna on site	9.1	Fauna must have 'right of way' on the internal gravel compacted roads. Slow moving animals such as tortoises which may be in the way, should be placed at the side of the road in the direction the animal was seen travelling.	Monitoring reports and photographic evidence	Solaire Direct	Throughout operation
			9.2	All vehicles must remain within designated and prepared roads and a speed limit of 30 km/hr must be enforced.	Signage		
			9.3	It should be mandatory for staff of Solaire Direct to attend an environmental briefing and training session with respect to the guidelines outlined in this OEMPr.	Environmental Training and Appropriate Signage		
			9.4	Ensure that no larger fauna enter and become trapped within the fenced-off area, either by leaving a gate open so that animals can move freely between the site and the adjacent farm or by keeping all gates closed to ensure that they are excluded.	ECO Report		
			9.5	No unauthorized persons should be allowed onto the site.			
			9.6	Staff present during the operational phase should receive environmental education so as to ensure that that no hunting, killing or harvesting of plants and animals occurs.	Environmental Training		
			9.7	The collection, hunting or harvesting of any animals at the Site will be strictly forbidden. Any personnel found collecting, hunting or harvesting of any animals will be removed from the Project permanently and removed from the Site immediately. Solaire Direct will develop and implement a disciplinary procedure for personnel who are caught conducting such activities.	ECO Report		
			9.8	Fires will only be allowed within fire-safe demarcated areas.			
			9.9	No fuel wood collection will be allowed on-site.			
			9.10	No dogs will be allowed on the Site.			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
			9.11	All hazardous materials will be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the Site will be cleaned up in the appropriate manner as related to the nature of the spill.			
			9.12	If the Site must be lit at night for security purposes, this will be done with low-UV type lights (such as most LEDs), which do not attract insects.			
			9.13	Monitor and document compliance with the above stipulated mitigation measures.	Monitoring Reports		
10.	Avifauna Impact	Minimise avifauna impacts	10.1	Any electrocution and collision events that occur will be recorded, including the species affected and the date. If repeated collisions occur within the same area, then further mitigation and avoidance measures may need to be implemented.	Monitoring Reports	Solaire Direct	Throughout operation
			10.2	Minimize the disturbance impacts associated with the maintenance of the powerline, by abbreviating maintenance times, scheduling maintenance activities around avian breeding schedules where necessary, and lowering levels of associated noise.			
			10.3	Attaching spikes and other deterrents to specific positions on the structures, to prevent birds from perching in areas with an electrocution risk.			
			10.4	Bird flappers to be used on the entire length of the powerline.			
			10.5	Monitoring of bird activity in the vicinity of the PV power facility should be done over a single day at least every two months for the six months preceding construction, and at least once per quarter for a full calendar year starting at least six months after the PV power facility is commissioned. Each monitoring period should involve full-day counts of all species flying over or past the PV power facility impact area.			
			10.6	Any electrocution and collision events that occur should be			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				recorded, including the species affected and the date. If repeated collisions occur , then further mitigation and avoidance measures may need to be implemented.			
11.	Management of hazardous substance spillage	Minimizes impacts of hazardous substances	11.1	Any spillage of hazardous substance to be reported to ESM and local authority	Visual inspection of incident to evaluate potential threat for contamination of water course / ephemeral pan / groundwater.	Solaire Direct / Appointed rep	Immediately following spillage
			11.2	Suitable mitigation actions to be recommended.	Report to local authority / relevant State Department.	ESM	As soon as required to prevent further damage
			11.3	Implementation of recommended actions.	Visual inspection	Solaire Direct / Appointed rep / ESM to coordinate	As required by recommended mitigatory actions
			11.4	Detailed records kept of all such incidents.	Report to appropriate level of government as required by legislation	Solaire Direct / Appointed rep / ESM	Immediately following each incident
12.	Maintenance of PV power facility	Environmental management during general maintenance	12.1	Notify ESM of external maintenance to be undertaken.	Visual inspection of area	Solaire Direct / Appointed rep	Prior to external maintenance
			12.2	Specify environmental procedures to prevent environmental contamination.	Visual monitoring of maintenance to ensure compliance with specification	ESM	Prior to starting work
			12.3	CEMPr (section 4 of this document) to be applicable to significant maintenance activities.	Reports of transgressions to ELC / Solaire Direct		
13.	Destruction and Loss of Grazing Capacity and Agricultural Potential	Minimize any further loss of Agricultural Potential	13.1	Vehicles for maintenance will only drive on demarcated roads.	Visual inspection and ECO Report	Solaire Direct	Throughout operation.
			13.2	Allow periodic grazing within the PV fields (sheep and wildlife). This mitigation will minimise the loss of grazing land and allow agricultural production to remain virtually unaffected.			
			13.3	In the unlikely event that heavy rains are expected,			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				maintenance-related construction activities will be put on hold to reduce the risk of erosion.			
			13.4	If additional earthworks are required, any steep or large embankments that are expected to be exposed during the rain months will be armoured with fascine-like structures.			
			13.5	If earth works are required, then storm water control and wind screening will be undertaken to prevent soil loss from the site.			
			13.4	Solaire Direct will minimise the damage to farmland caused by construction activities by ensuring strict compliance with construction plans to minimise the PV Footprint and to implement a 'Code of Conduct' governing workers.			
			13.5	Solaire Direct will design the infrastructure layout in a manner that limits the PV Footprint of the facility and all associated infrastructure.			
			13.6	Solaire Direct will not actively seek workers who are employed on the Drennan Farm, or surrounding farms.			
			13.7	Solaire Direct will assist farmers in explaining to their staff that employment on the Project would be temporary, and should not be seen as an alternative to existing employment.			
			13.8	Solaire Direct will ensure that wages paid on the Project are the equivalent to those paid in the area for work of a similar nature.			
			13.9	Any damage to vegetation would be rehabilitated in accordance with mitigation proposed for the rehabilitation of natural vegetation.			
			13.10	A designated area must be established for welding, cutting and any other "hot-work" and such work must be limited (as far as possible) to this area.			
			13.11	An Emergency Procedure will be developed and communicated to all surrounding landowners, workers and			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				other relevant stakeholders. All appropriate equipment for managing fires and other emergencies will be stored on the Site and maintained.			
			13.12	The contractor must ensure that a contact list for all neighbouring landowners is available on the Site so that all neighbours can be contacted in the event of a fire.			
			13.13	A firebreak must be established around the PV Footprint and must be maintained throughout the operation phase of the Solar PV Facility.			
14.	Emergency Procedures	To ensure a reduced risk to human life and of damage if a fire were to take place	14.1	Fire control system to be maintained according to the relevant SANS requirements.	Records of maintenance to be kept	Solaire Direct / ESM	As required by SANS requirements
			14.2	All measures to avoid the risk of fire according to the Environmental Regulations for Workplaces promulgated by Government Notice No. R2281 of 16 October 1987, as amended, should be adhered to.	Maintenance records to be kept	Solaire Direct / Appointed rep	As required
			14.3	Firefighting equipment to be visible.	Records of incidents to be kept		Prior to operation
			14.4	Emergency contact numbers must always be visible.			
			14.5	Ensure all site occupants adequately trained in evacuation and other procedures in the event of an emergency.	Records of emergency drills to be kept		As required
15.	Impacts on Surface Water and Groundwater	Minimize Impacts on Surface Water and Groundwater	15.1	All hazardous materials should be stored in the appropriate manner to prevent contamination of the Site..	Visual inspection and ECO Report	Solaire Direct	Throughout operation.
			15.2	Any accidental chemical, fuel and oil spills that occur at the the Site should be cleaned up in the appropriate manner as related to the nature of the spill.			
			15.3	Vehicles will be serviced and maintained off the Site.			
			15.4	No chemical additives will be used in undertaking the cleaning of PV panels.			
			15.5	Fuel, oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
16.	Audits And EMP Reviews	Environmental Audit	16.1	Audit relevance of management plan and its implementation.	Audit report to be presented to ELC, Solaire Direct and the DEA.	Independent Environmental auditor	Annually, commencing 1 year after start of operation.
		Recommend changes to OEMPr / implementation of OEMPr required	16.2	Recommended changes discussed with ELC, Solaire Direct and the DEA.			
		Review of OEMPr	16.3	Evaluate relevance of OEMPr, and identify additional issues requiring management and changes recommended by auditor.	Annually and following each audit		Following each audit
			16.4	Submit proposed changes to local authority, and DEA for approval	Obtain written approval from DEA	ESM	Prior to implementation
			16.5	Effect **changes**; include approved amendments as annexure to OEMPr where appropriate	Distribution of annexure / amended OEMP to all relevant parties	ESM	Within month of receipt of all approvals
17.	Employment Opportunities	Maximize local employment opportunities	17.1	The labour contract between Solaire Direct and Subcontractors who are appointed to provide services will specify local labour employment criteria, e.g. percentage of total workforce.	Procurement and Recruitment Policy	Solaire Direct	Throughout Operation
			17.2	Solaire Direct will Development a Procurement and Recruitment Policy which sets reasonable targets for the employment of South African and local residents / suppliers (originating from the local municipality) and promote the employment of women as a means of ensuring that gender equality is attained. Criteria must be set for prioritising, where possible, local (local municipal) residents / suppliers over regional or national people / suppliers.			
			17.3	Initial recruitment and training for local personnel will take place prior to and during the construction phase.			
18.	Local Economy Benefits	Enhance local economy benefits	18.1	Solaire Direct will Development a Procurement and Recruitment Policy which sets reasonable targets for the employment of South African and local residents / suppliers (originating from the local municipality) and promote the employment of women as a means of ensuring that gender equality is attained. Criteria must be set for prioritising,	Procurement and Recruitment Policy	Solaire Direct	Throughout Operation

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				where possible, local (local municipal) residents/suppliers over regional or national people/suppliers. Additionally, a local community trust will be set up.			
19.	Inflation and Increased Cost of Living	Limit Inflation and Increased Cost of Living	19.1 19.2	Mitigation measures proposed regarding the employment procedures and communication of opportunities will serve to reduce the influx of job-seekers. Solaire Direct will conduct a census of local accommodation options to ensure that the accommodation requirements can be met. Solaire Direct should work with the Local Municipality to address accommodation shortages should this be the case.	Procurement and Recruitment Policy	Solaire Direct	Throughout Operation
20.	Social Nuisance Factors	Minimise Social Nuisance Factors	20.1 20.2 20.3	Solaire Direct and its appointed contractors will develop an induction programme, including a Code of Conduct, for all workers (including contractors and their workers). A copy of the Code of Conduct to be presented to all workers and signed by each person. The Code of Conduct will address the following aspects: o respect for local residents; o respect for farm infrastructure and agricultural activities; o no hunting or unauthorised taking of products or livestock; o zero tolerance of illegal activities by construction personnel including: unlicensed prostitution; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or violent behaviour; o compliance with the Traffic Management Plan and all road regulations; and o description of disciplinary measures for infringement of the Code of Conduct and company rules. If workers are found to be in contravention of the Code of Conduct, which they signed at the commencement of their contract, they will face disciplinary procedures that could result in dismissal. Stock theft should be noted as a	Code of Conduct	Solaire Direct	Throughout Operation

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				dismissible offence.			
			20.4	Solaire Direct must develop and implement a grievance procedure that is easily accessible to local communities, through which complaints related to contractor or employee behaviour can be lodged and responded to. Solaire Direct must respond directly to such complaints. Key steps of the grievance mechanism include: o circulation of contact details of 'grievance officer' or other key Solaire Direct contacts. o awareness raising among local communities (including all directly affected and neighbouring farmers) regarding the grievance procedure and how it works. o establishment of a grievance register to be updated by Solaire Direct, this should include all responses and response times.			
			20.5	Solaire Direct, together with the appointed contractors must develop a means of monitoring access to the Site, prohibiting unauthorised access to the Site and ensuring that all visitors report to the Site office.			
			20.6	No employment will take place at the entrance to the Site. Only formal channels for employment will be used.			
			20.7	Solaire Direct will award a contract to an appropriate security company, to provide 24hr security at the Site. The security company will comply with the above mentioned Code of Conduct.			
			20.8	Solaire Direct must develop and implement an HIV / AIDS policy and information document for all workers directly related to the Project. All contractors must implement this policy. The information document will address factual health issues as well as behaviour change issues around the transmission and infection of HIV / AIDS. Solaire Direct will make condoms available to employees and all contractor workers.			
			20.9	The construction workers (from outside the area) should be			

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OPERATIONAL PHASE							
Activity		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Activity		#	Commitment / Actions Required / Key Controls			
				allowed to return home over the weekends or on a regular basis to visit their families. The contractor should make the necessary arrangement to facilitate these visits.			
21.	Community Investment	Maximise the benefits of community investments	21.1	The objective of these enhancement measures is to optimise the benefits to the local community through the Development and operation of a Community Trust. Solaire Direct's financial contribution towards a community trust will be linked to the finalisation of the tariff as part of the PPA. The following enhancement measures should be implemented to enhance the benefit to the local community:	Community Trust documentation	Solaire Direct	From inception of and throughout life of the Community Trust
			21.2	Solaire Direct will calculate their contribution towards the Community Trust and establish the Trust in accordance with the relevant laws and guidelines.			
			21.3	Suitable reporting and governance mechanisms will be established and integrated into the Trust set-up and operation.			
			21.4	Projects will be identified in collaboration with the local Municipality and community representatives, to ensure alignment with the key needs identified through the Integrated Development Planning process.			
			21.5	Projects will be identified in collaboration with the land owners as well as other local stakeholders to improve general living conditions and access to better living standards in the broader area.			
			21.6	Projects will be implemented in partnership with the Local Municipality and community representatives to ensure the maximisation of benefits within the local community.			
			21.7	All projects will be aligned with Solaire Direct's policies.			
			21.8	Solaire Direct will have a clear exit strategy from Community Trust and the associated Projects. This strategy will, as far as possible, ensure that the projects are sustainable and have the organisational capacity to operate without the support of Solaire Direct.			

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5.6.1 Litter and Waste Management

A litter and waste management system must be established by Solaire Direct. Litter and waste management should address the following:

Recycling

It is recommended that a recycling program be established for the Site as a whole, but specifically for the admin and maintenance buildings and all occupants at the Site. This may be achieved via an agreement with the waste management contractor for the site. Solaire Direct must make adequate staff resources available to implement and manage the recycling program. Waste separation is best conducted at source, and the recycling waste storage area must as a minimum separate waste into the following categories:

- Paper products;
- Cardboard;
- Glass;
- Plastics; and
- Metals.

Recycling will involve greater effort, but offers the reward of environmentally sustainable practices and potential employment opportunities. The Solaire Direct should establish what recycling facilities are available within the broader area and determine a recycling program that can support any community efforts already underway.

Solid waste

A distinction should be made between dry solid waste and wet solid waste. These should be separated and collected in different containers for storage at a central waste depot before removal to a recognised municipal waste facility.

All waste storage areas are to be kept in a clean and hygienic condition to prevent odours, spreading of litter, and scavengers.

The frequency of collection must be determined and specified by the ELC / Solaire Direct in this OEMPr.

Refuse and litter management is to be monitored visually by the ESM. Findings are to inform changes in the waste management procedures to eliminate litter problems.

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Hazardous Waste

Should any hazardous waste be generated by the Solar PV Facility, this must be disposed of at a hazardous waste facility and any health and safety requirements for the storage, transport and disposal of hazardous waste must be adhered to.

5.6.2 *Maintenance of Development*

This section refers to both internal and external maintenance of the Project.

- Solaire Direct must notify the ESM of any external maintenance to be undertaken. Any significant structural maintenance should require compliance with the CEMPr.
- The ESM must specify any additional environmental procedures necessary to prevent contamination of the environment.
- Solaire Direct is responsible for notifying the maintenance contractor of the conditions under which maintenance is to be done.

5.6.3 *Emergency Procedures*

An appropriate and timeous response to emergency situations will ensure that the environmental consequences of such situations are managed and curtailed. Since the fire is seen as the most likely foreseeable emergency for the Site, the emergency procedure for fire is provided below. In the event of a fire occurring, the requisite procedure shall be implemented. To ensure preparedness, all key staff on site shall be trained in terms of the requirements of this emergency procedure.

Solaire Direct shall ensure that the fire control system is maintained according to the relevant SANS requirements.

Solaire Direct shall ensure that all measures to avoid the risk of fire according to the Environmental Regulations for Workplaces promulgated by Government Notice No. R2281 of 16 October 1987, as amended, is adhered to. Firefighting equipment is to be visible

Emergency procedure in the event of a fire

- Contact relevant parties as well as local fire department and report the location and details of the fire;
- Alert other staff by sounding an alarm / siren;
- Attend to human life in danger, remove all combustible items in the vicinity (where possible), and guide people away from danger area;

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- If trained, personnel to attempt to extinguish the fire without endangering life; and

- If uncertain or unable to extinguish the fire, leave the area and wait for assistance.

Emergency contact details

A list of emergency services contact numbers shall be posted on the Site. As a minimum, the following emergency services shall be included on the list:

- DEDEAT (Chris Hani regional Office): +27 (0) 45 838 3983
- Fire Department: 10111
- Disaster Management: 107
- Ambulance Services: 10177
- South African Police Services: 10111

5.6.4 *OEMPr Review and Audit*

OEMPr Review

A schedule for the review of the OEMPr should be established by the ELC / Solaire Direct. It is recommended that the effectiveness of the OEMPr be reviewed on an annual basis, and possibly bi-annually in the first year of operation.

Any proposed changes are to be submitted by the ESM to DEA for approval prior to implementation. Amendments or additions made to the document (with the approval of the relevant authorities) are to be included as annexures, distributed to all relevant parties, and should be considered as OEMPr specifications to which all relevant parties are bound.

Results of environmental audits (see section 5.6.5.2) are to inform the ELC / Solaire Direct of changes required to the EMPr documentation.

OEMPr Audit

Audits of the OEMPr implementation in the Development should be undertaken on a regular basis. Internal audits (by the ESM) should be done on a quarterly basis with an external audit conducted by an independent consultant undertaken as specified below.

An independent environmental auditor is to be employed after the first year of operation, and annually thereafter, to perform a formal audit on the management plan, and its implementation by the relevant parties.

DRAFT

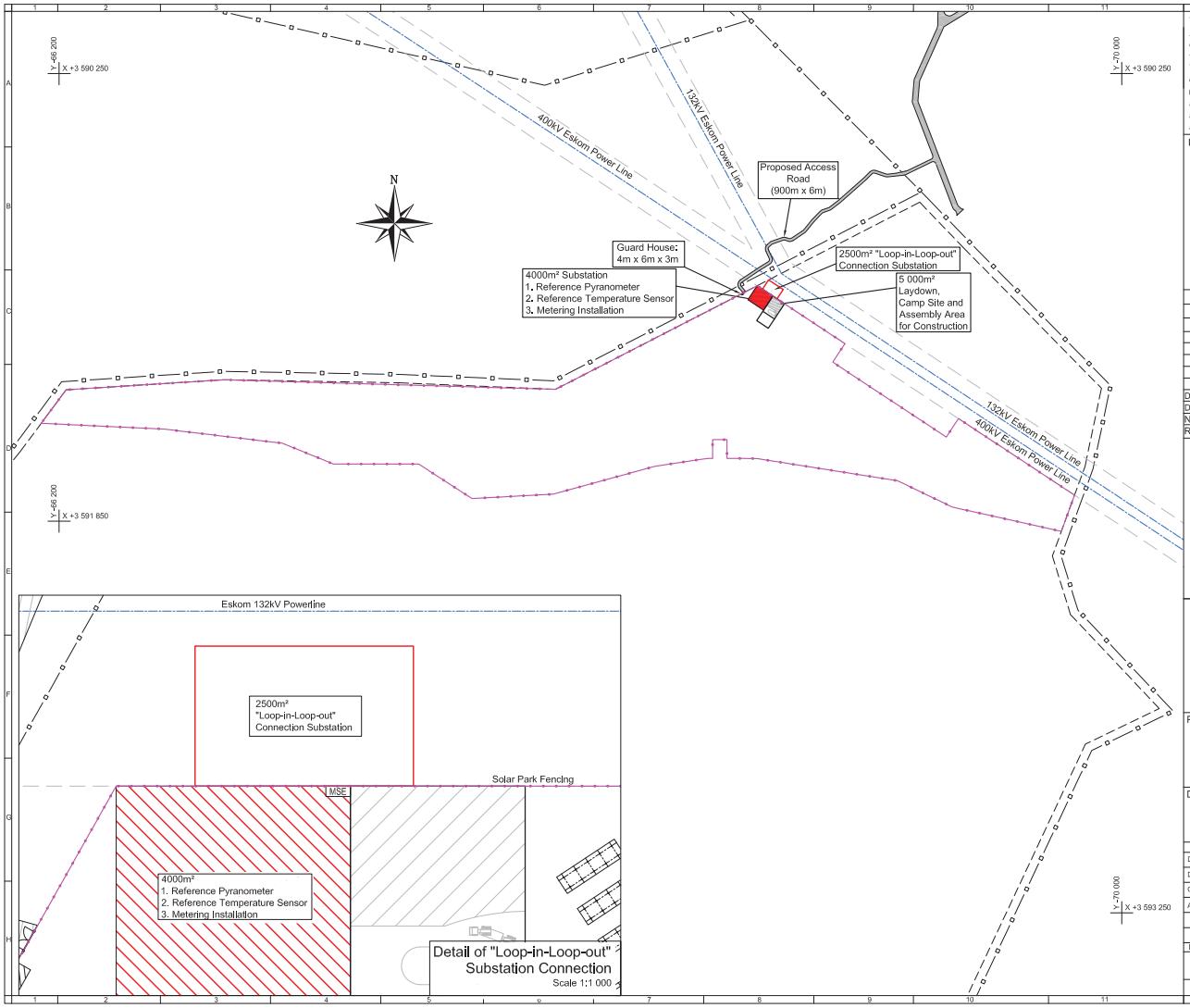
Each audit is to be based on Site visits by the auditor as well as a review of any records of environmental management to be kept by the ESM. The audit must also determine whether the OEMPr is adequately dealing with the range of environmental impacts on the Site, i.e. whether the plan is still appropriate, or whether it needs to be extended.

The audit report is to include recommendations of changes required to the OEMPr document, management practices, etc., to improve environmental management of the Site. The results of this audit are to be submitted to the provincial and local environmental authority, and to DEA.

DRAFT

Annex L

Project Specifications



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LEGEND

- 400/132kV Eskom Powerline
- Property Boundary
- Solar Panel Structure
- Existing Roads
- Access Roads
- Solar Park Fencing
- Guardhouse
- 30m Building Line
- Transformer

Co-ordinates of Site Bench Marks

POINT	Y / Latitude	X / Longitude
Drennan Substation	-67 754.896	3 589 094.425
Drennan Substation	32°25'25.75"S	25°43'15.37"E

Note:
Refer to Setting out Data sheet for Boundary Fence

solairedirect
Southern Africa

PROJECT
Drennan Solar Power Park (Pty) ltd
87.55MWp (76MWac)

DRAWING TITLE
LAYOUT OF PROPOSED TRANSMISSION LINE

	SIGNATURE FOR SD	DATE	PR.No.	SHEET SIZE
DESIGNED	G.B.	07/12	No	A3
DRAWN	RDT	07/12	No	SCALE
CHECKED	G.B.	07/12	No	1:12 500
APPROVED	G.B.	PR.ENG: 080093		DWG STATUS
				I=INFO

SD DRAWING NUMBER
DWG
DRE-EX-EL-TRA-3002

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LEGEND

- Property Boundary
- Existing Eskom Powerline
- Existing Roads
- Solar Park Fencing
- Ex. Eskom Powerline and 50m Buffer
- Ex. Roads with 100m Buffer
- Ex. Farm boundary with 30m Buffer
- River with 50m Buffer
- Heritage site (NO-GO Area)
- High Sensitive Area
- Very High Sensitive Area

GPS Coordinates to Substation		
Drennan Substation	-67 754.896	3 589 094.425
Drennan Substation	32°25'25.75"S	25°43'15.37"E

Distance to closest town:
Approximately 40.50km to Cradock via R390

solairedirect
Southern Africa

PROJECT

Drennan Solar Power Park (Pty) ltd
87.55MWp (76MWac)

DRAWING TITLE

LOCALITY PLAN

	SIGNATURE FOR SD	DATE	PR.No.	SHEET SIZE
DESIGNED	G.B.	10/12	No	A3
DRAWN	RDT	10/12	No	SCALE
CHECKED	G.B.	10/12	No	1:15 000
APPROVED	G.B.	PR.ENG: 080093		DWG STATUS
				I=INFO

SD DRAWING NUMBER
DWG

DRE-EX-GE-LP-0001-A

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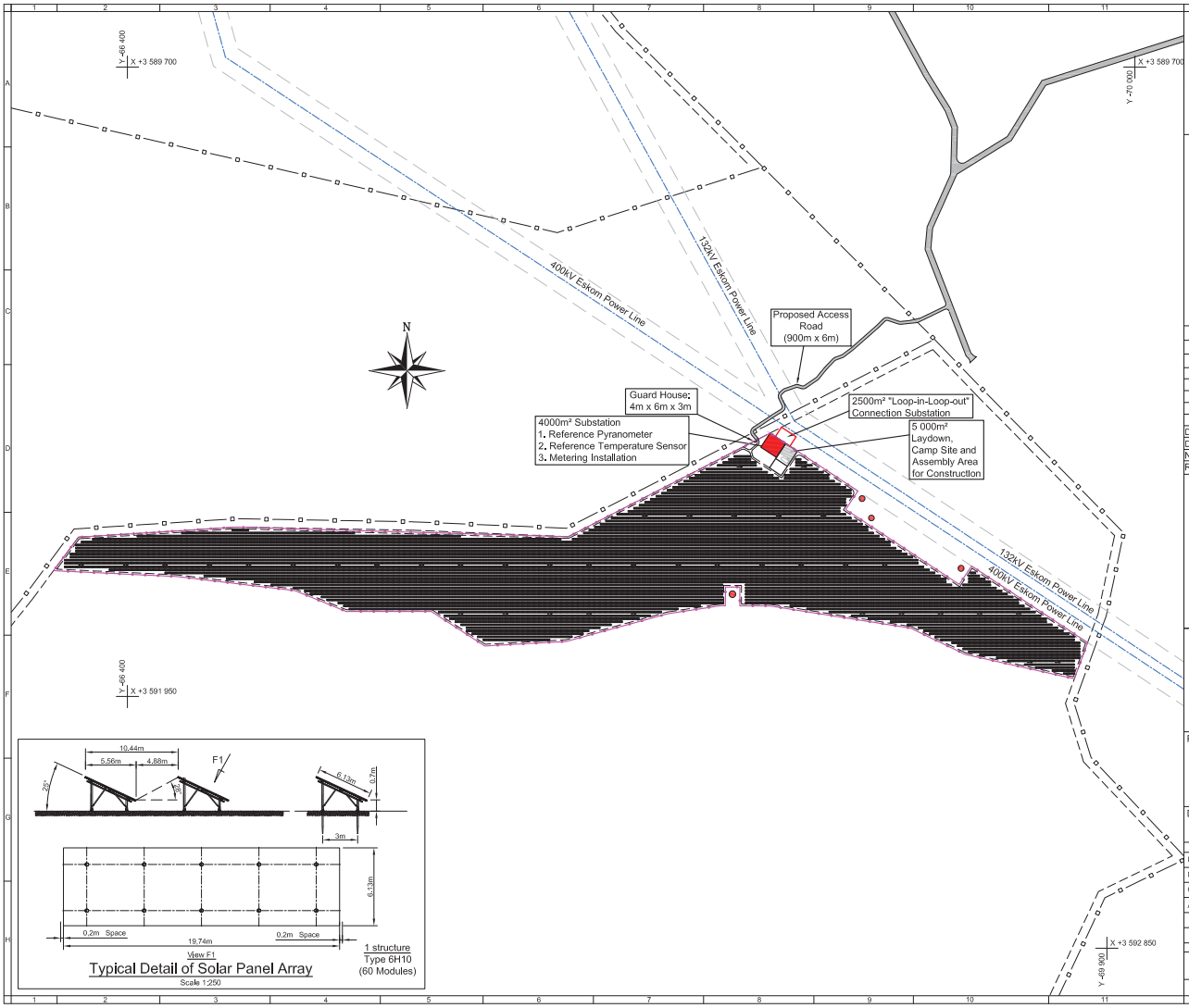

Typical Detail of Solar Panel Array
Scale 1:250

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Solar Park Area:	116.75ha
Leashold Erf Area:	-ha
Total PV Modules:	291 840
Fence Height:	2.4m
Trenching: (below ground level)	800mm
Invert/ITE (L x W x H)	7m x 3m x 3.5m
No of Inverters:	76
Array Enclosure:	1m² area
Foundation footprint:	concrete or steel screw piles
Borrow pits: (unlikely to be required)	none
Building for accomodation:	None on site
Permanent Laydown area:	None
Cut and Fill:	None

Co-ordinates of Site Bench Marks

POINT	Y / Lattitude	X / Longitude
Drennan Substation	-67 754.896	3 589 094.425
Drennan Substation	32°25'25.75"S	25°43'15.37"E

Note:
Refer to Setting out Data sheet for Boundary Fence

LEGEND

- 400/132kV Eskom Powerline
- Property Boundary
- Solar Panel Structure
- Existing Roads
- Access Roads
- Solar Park Fencing
- Guardhouse
- 30m Building Line
- Transformer

solairedirect
Southern Africa

PROJECT

Drennan Solar Power Park (Pty) ltd
87.55MWp (76MWac)

DRAWING TITLE

SITE PLAN

	SIGNATURE FOR SD	DATE	PR.No.	SHEET SIZE
DESIGNED	G.B.	10/12	No	A3
DRAWN	RDT	10/12	No	SCALE
CHECKED	G.B.	10/12	No	1:12 500
APPROVED	G.B.	PR.ENG: 080093		DWG STATUS
				I=INFO

SD DRAWING NUMBER

DWG

DRE-EX-GE-SP-0002-A

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Appendix A

Alien Invasive Management Sub-Plan

DRENNAN SOLAR ENERGY FACILITY

ALIEN INVASIVE PLANT MANAGEMENT PLAN

PRODUCED FOR ERM

ON BEHALF OF SOLAIREDIRECT

BY

SIMON TODD CONSULTING

Simon.Todd@3foxes.co.za

JUNE 2013

ALIEN MANAGEMENT PLAN OBJECTIVE

The purpose of the Drennan Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Drennan Solar Energy Facility. The broad objectives of the plan includes the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal & encroachment
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Promote the natural re-establishment and planting of indigenous species

PROBLEM BACKGROUND & LEGISLATIVE BACKGROUND

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that landusers clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties.

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a landuser must obtain a water use licence as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species:

Bromilow, C. 2010. *Problem Plants and Alien Weeds of South Africa*. Briza, Pretoria.

ALIEN SPECIES PRESENCE & ABUNDANCE AT DRENNAN

The Drennan site is currently lightly invaded by alien species. The density of alien species within the intact vegetation is generally low and is restricted to species such as *Opuntia ficus-indica* and *Opuntica aurantica*. Within disturbed areas such as along roadsides and near watering points other species such as *Argemone ochroleuca*, *Conyza bonariensis*, *Salsola kali*, *Xanthium spinosum*, *Bidens pilosa*, *Cirsium vulgare* and *Tagetes minuta* were observed. These species generally do not invade intact veld, but quickly invade disturbed areas and as they are already present in the area, would increase rapidly at the site following construction activities. The *Opuntia* species are illustrated below and additional information on these as well as the other alien species including photographs can be found on the following website: http://www.invasives.org.za/invasive-plants.html

Opuntia aurantica

Opuntia ficus-indica

ACTIVITIES LIKELY TO IMPACT ALIEN SPECIES ABUNDANCE

Alien species are adept at taking advantage of disturbance. The weedy and annual species listed above will take advantage of any disturbance at the site. The site is also in close proximity to several sources of alien species, including the railway line which has abundant alien species along the track as well as the areas of intensive agriculture along the Fish River. As a result any activities which result in the loss of plant cover or the disturbance of the soil surface will stimulate the invasion of alien species. This

includes clearing for roads, panels arrays, substations and any other infrastructure. Within the context of the site, areas which receive runoff and those areas of disturbed soil which are not rehabilitated are likely to be most vulnerable to alien invasion, in the short term as well as during the operation phase of the development. As runoff can create erosion and disturbance, it is also likely that poor runoff management at the site will promote the invasion of alien species.

GENERAL CLEARING & GUIDING PRINCIPLES

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area.
- The lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses. The current site is relatively small and therefore seed input from adjacent already disturbed areas is likely to be the major source of alien species at the site. Therefore for effective control, a larger area than the site may need to be cleared.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

CLEARING METHODS

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.
- Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website. http://www.dwaf.gov.za/wfw/Control/
- The *Opuntia* species at the site are likely to pose the greatest control problem as these species reproduce vegetatively as well as from seed. Therefore plants must be removed from the site and burned or controlled with herbicides which are not always effective.

USE OF HERBICIDES FOR ALIEN CONTROL

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which resprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

ALIEN PLANT MANAGEMENT PLAN

CONSTRUCTION PHASE ACTIVITIES

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Action	**Frequency**
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute	Weekly

(Soil Saver) may be pegged over the soil to stabilise it.	
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32m of any wetland, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only.	Monthly
Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

MONITORING – CONSTRUCTION PHASE

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	**Indictor**	**Timeframe**
Document alien species present at the site	List of alien species	Preconstruction
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control	Record of clearing activities	3 Monthly

measures implemented		
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

OPERATIONAL PHASE ACTIVITIES

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Action	**Frequency**
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

MONITORING – OPERATIONAL PHASE

The following monitoring and evaluation actions should take place during the operational phase of the development.

Monitoring Action	**Indictor**	**Timeframe**
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and	Biannually

	cover over time at the site	
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

CONCLUSIONS AND RECOMMENDATIONS

- As there are already a number of alien species present at the site, alien invasion following disturbance at the site is likely to occur rapidly. As a result, alien control should begin during the construction phase to ensure that the density and abundance of alien species remains manageable into the operational phase.
- In the short-term, soil disturbance is likely to be the dominant driver of alien invasion at the site. While, in the long-term the distribution of runoff is likely to be a key driver as those areas which receive water will be wetter and likely to contain a higher alien abundance.
- As disturbance is the major initial driver of alien species invasion, keeping the disturbance footprint to a minimum is a key element in reducing alien abundance. Wherever possible, the indigenous vegetation should be left intact as this will significantly reduce the likelihood of alien invasion.

Appendix B

Plant Rescue and Protection Sub-Plan

DRENNAN SOLAR ENERGY FACILITY

PLANT RESCUE AND PROTECTION PLAN

PRODUCED FOR ERM

ON BEHALF OF SOLAIREDIRECT

BY

SIMON TODD CONSULTING

Simon.Todd@3foxes.co.za

JUNE 2013

BACKGROUND & PURPOSE

The purpose of the Drennan Solar Energy Facility plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Drennan Solar Energy Facility and associated infrastructure on listed and protected plant species and their habitats. Although this report identifies those species suitable for search and rescue at the site, it is important to note that a preconstruction walk-through of the site would also be important to refine the list of species identified for search and rescue, as well as locate such species prior to construction.

MITIGATION & AVOIDANCE OPTIONS

Solar energy facilities result in a relatively high impact, concentrated within a relatively confined area. The distribution and location of infrastructure within solar facilities is not very flexible and as a result there are not a lot of avoidance options possible. Therefore, within solar energy facilities, once the final footprint has been defined, the primary remaining mitigation option for species of conservation concern is translocation. In some cases, the entire footprint of the solar energy footprint is cleared and levelled prior to construction, in which case all species of concern should be translocated. However, in some situations, the vegetation between the rows of panels can be left intact and smaller species can remain unharmed in these areas. However, even in the latter case, the impact of the construction activities is very high and larger species and those vulnerable to trampling should be translocated prior to construction. It is also important to recognise that translocation equates only to partial mitigation as the individuals may be saved, but the habitat is lost with long-term implications for affected populations. In addition, not all translocated individuals will survive and the proportion of plants surviving will vary from species to species. Some species such as most trees and woody shrubs are not suitable for translocation on account of their deep rooting systems and cannot be translocated and their loss must be accepted as an outcome of the development.

RESCUE AND PROTECTION PLAN

Preconstruction

Before construction commences at the site, the following actions should be taken:

- Identification of all listed species which may occur within the site, this is largely provided here, but would be supplemented following the walk-through.
- Walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. These results should be used to inform any final minor adjustments to the layout, as well as direct preconstruction search and rescue at the site.

- Search and rescue operation of all listed species within the development footprint. Affected individuals of suitable species should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes. The ecological walk-through provides the basis for the search and rescue and the search and rescue itself should also be used as an opportunity to identify additional individuals of listed species for rescue.
- Ideally, translocation should happen during one of the cooler months in order to promote survival, with the optimal period at the site likely to be March to June. This will give the translocated plants sufficient time to recover before the next hot season.
- Although species such as geophytes are best translocated when they are dormant, they can be hard to locate at this time and therefore, any time would be acceptable for such species. Porcupines may however learn to recognize the holes where plants have been translocated to and can destroy large numbers of translocated plants during the dry season when other food is scarce.

Construction Phase

- ECO to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO and any listed species present which are able to survive translocation should be translocated to a safe site.
- Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site.
- Many listed species are also sought after for traditional medicine or by collectors and so the ECO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed.
- The ECO should monitor construction activities in sensitive habitats such as near rivers and wetlands carefully to ensure that impacts to these areas are minimized.
- Populations of sensitive species or important habitats near the development footprint should be cordoned-off with construction tape or similar barrier and marked as no-go areas.
- No unauthorised personnel to be allowed on-site.
- No fires on-site.

Operation

- Access to the site should be strictly controlled and all personnel entering or leaving the site should be required to sign and out with the security officers.
- The collecting of plants of their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the site.

IDENTIFICATION OF LISTED SPECIES

Species of conservation concern are identified according to the Red List of South African Plants http://redlist.sanbi.org/redcat.php. All such species known from the area are listed below. At a provincial level, protected species are listed under a number of acts, namely the Eastern Cape Nature Conservation Act, 19 of 1974 and variously amended thereafter as well as the Transkei Decree (No 9 Of 1992) and the Ciskei Nature Conservation Act of 1987. Species listed under the National Red Data List of Plants as well as those protected under the provincial legislation must be specified on permit applications required for site clearing.

Table 1. Species listed under the Red List of South African Plants, which were observed and can be confirmed as being present at the Drennan site.

Species	Status	Likelihood
Aloe longistyla	DDD	Confirmed
Boophone disticha	Declining	Confirmed
Drimia altissima	Declining	Confirmed
Euphorbia globosa	EN	Confirmed

Table 2. Species listed under the Red List of South African Plants, which were not observed at the site, but which may occur at the site. Some of the species are large and conspicuous and given the limited extent of the development and the open nature of the site, they can be confirmed as not being present.

Species	Status	Likelihood
Pelargonium reniforme subsp. reniforme	DDD	Low Possibility
Salvia repens var. keiensis	DDD	Low Possibility
Cineraria lobata subsp. lobata	Declining	Low Possibility
Pelargonium sidoides	Declining	Low Possibility
Gnaphalium declinatum	NT	Low Possibility
Alepidea delicatula	Rare	Low Possibility
Gasteria baylissiana	Rare	Low Possibility
Dierama grandiflorum	Rare	Low Possibility
Aloinopsis rubrolineata	Rare	Low Possibility
Alepidea macowani	VU	Low Possibility
Diascia ramosa	VU	Low Possibility
Elaeodendron croceum	Declining	Not Present
Dioscorea elephantipes	Declining	Not Present
Rapanea melanophloeos	Declining	Not Present
Protea lacticolor	EN	Not Present
Asparagus stipulaceus	NT	Not Present

Encephalartos lehmannii	NT	Not Present
Kniphofia acraea	Rare	Not Present
Protea subvestita	VU	Not Present

Other species and genera which occur at the site and which are protected by provincial legislation include members of the following families and genera:

- *Gasteria – All Species*
- *Haemanthus* – All Species
- *Mesembryanthemaceae* - All species

The above list is not exhaustive and represents a small proportion of the protected species in the province, but highlights the dominant species observed at the site

Individuals and species of protected species suitable for search and rescue which were not identified and located during the walk-through survey but which are observed during the search and rescue operation should also be translocated at the same time.

MONITORING & REPORTING REQUIREMENTS

The following reporting and monitoring requirements are recommended as part of the plant rescue and protection plan:

- Monitoring during construction by the ECO to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented.
- Post construction monitoring of plants translocated during search and rescue to evaluate the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.
- Operational phase compliance monitoring of any incidents and transgressions.

GUIDE TO SPECIES FOR SEARCH AND RESCUE

The following photographs illustrate the species observed at the site which are suitable for search and rescue. The list is not complete, but serves to illustrate the majority of species likely to be encountered at the site.

Aloe ferox

Aloe maculata

Aloe tenuior

Aloe variegata

Euphorbia globosa

Harworthia decipiens var minor

Haemanthus albiflos

Gasteria bicolor

Aloe longistyla

Euphorbia micracantha

Albuca setosa

Astroloba congesta

Drimia altissima (Declining)

Boophone disticha (Declining)

Appendix C

Re-vegetation and Rehabilitation Sub-Plan

DRENNAN SOLAR ENERGY FACILITY

REVEGETATION & REHABILITATION PLAN

PRODUCED FOR ERM

ON BEHALF OF SOLAIREDIRECT

BY

SIMON TODD CONSULTING

Simon.Todd@3foxes.co.za

JUNE 2013

BACKGROUND & PURPOSE

The purpose of the Drennan Solar Energy Facility revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed Facility are rehabilitated with a plant cover that reduces the risk or erosion from these areas as well as restores some ecosystem function. The purpose the rehabilitation at the site can be summarized as follows:

- Achieve long-term stabilisation of all disturbed areas to minimise erosion potential;
- Re-vegetate all disturbed areas with suitable local plant species;
- Minimise visual impact of disturbed areas; and
- Ensure that disturbed areas are safe for future uses.

It is also important to recognize that the rehabilitation plan should be closely aligned with the erosion control plan as the two factors are inextricably linked.

ECOSYSTEM CONTEXT

The site occurs within a semi-arid environment and a fundamentally different approach to rehabilitation efforts in such areas is required as compared to traditional rehabilitation approaches within more mesic areas. In addition, rehabilitation techniques which rely on agricultural techniques such as the application of fertilizer and the planting of annual grasses or other alien species are not appropriate. The major implication of the semi-arid nature of the site is that the use of appropriate species and techniques is key in order to achieve long-term success.

REHABILITATION MANAGEMENT PRINCIPLES

Topsoil management

Effective topsoil management is a critical element of rehabilitation, particularly in arid and semi-arid areas where soil properties are a fundamental determinant of vegetation composition and abundance. Although some parts of the site consist of exposed bedrock, most parts of the site have at least some topsoil. Where any excavation or topsoil clearing is required, the topsoil should stockpiled and later used to cover cleared and disturbed areas once construction activity has ceased.

- Topsoil is the top-most layer (0-25cm) of the soil in undisturbed areas. This soil layer is important as it contains nutrients, organic matter, seeds, micro-organisms fungi and soil fauna. All these elements are necessary for soil processes such as nutrient cycling and the growth of new plants. The biologically active upper layer of the soil is fundamental in the maintenance of the entire ecosystem.

- Topsoil should be retained on site in order to be used for site rehabilitation. The correct handling of the topsoil is a key element to rehabilitation success. Firstly it is important that the correct depth of topsoil is excavated. If the excavation is too deep, the topsoil will be mixed with sterile deeper soil, leading to reduction in nutrient levels and a decline in plant performance on the soil.
- Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods.
- If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible. The longer the topsoil is stored, the more seeds, micro-organisms and soil biota are killed.
- Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil.
- If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to intercept any sediment and runoff should be directed away from the stockpiles upslope.

MULCHING

Mulching is the covering of the soil with a layer of organic matter of leaves, twigs bark or wood chips, usually chopped quite finely. The main purpose of mulching is to protect and cover the soil surface as well as serve as a source of seed for revegetation purposes.

- During site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter. The cleared vegetation should be stockpiled and used whole or shredded by hand or machine to protect the soil in disturbed areas and promote the return of indigenous species.
- Mulch should be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities;
- Brush-cut mulch should be stored for as short a period as possible, and seed released from stockpiles can also be collected for use in the rehabilitation process.

SEEDING

In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required. Seed should be collected from plants present at the site and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch.

- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien or invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- Seed may be harvested by hand and if necessary dried or treated appropriately
- Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs must be kept apart from individually harvested seed;
- No seed of alien or foreign species should be used or brought onto the site.
- Within the context of the site seed of perennial grasses such as *Eragrostis lehmanniana* and shrubs such as *Pentzia incana* would be suitable species for collection.

TRANSPLANTS

Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. This can be an effective means of establishing indigenous species quickly.

- Plants for transplant should only be removed from areas that are going to be cleared.
- Perennial grasses, shrubs, succulents and geophytes are all potentially suitable candidates for transplant.
- Transplants should be placed within a similar environment from where they came in terms of aspect, slope and soil depth.
- Transplants must remain within the site and may not be transported off the site.
- Some species can also grow from cuttings and branches of many succulent species can be rooted in the field. Some species such as *Pentzia incana* can also be grown from cuttings but would need to be rooted in pots under irrigation first.

USE OF SOIL SAVERS

On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.

- In areas where soil saver is used, it should be pegged down to ensure that is captures soil and organic matter flowing over the surface.
- Soil saver may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination. Alternatively, fresh mulch containing seed can be applied to the soil saver.

GENERAL RECOMMENDATIONS

- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible.
- Once revegetated, areas should be protected to prevent trampling and erosion.
- No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
- Where rehabilitation sites are located within actively grazed areas, they should be fenced.
- Fencing should be removed once a sound vegetative cover has been achieved.
- Any runnels, erosion channels or wash aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

MONITORING REQUIREMENTS

As rehabilitation success, particularly in arid areas is unpredictable, monitoring and follow-up actions are important to achieve the desired cover and soil protection.

- Re-vegetated areas should be monitored every 4 months for the first 12 months following construction.
- Re-vegetated areas showing inadequate surface coverage (less than 30% within 12 months after re-vegetation) should be prepared and re-vegetated;
- Any areas showing erosion, should be re-contoured and seeded with indigenous grasses or other locally occurring species which grow quickly.

CONCLUSIONS AND RECOMMENDATIONS

- The most cost-effective way to reduce the cost and effort for rehabilitation is to reduce and minimize the disturbance footprint. If the panel arrays can be constructed without clearing the site, then the amount of rehabilitation required would be low and any cleared areas would quickly become revegetated.
- The solar panels and roads within the development represent hard surfaces that will generate a lot of runoff. As a result, effective runoff management is essential as is an effective vegetation cover to prevent widespread erosion across the site. As the majority of the site is sloping, the risk of erosion is high and retaining vegetation cover between the rows of panels during construction is strongly recommended.
- The dominant species at the site are quick growing and would also be suitable candidates for rehabilitation. This includes the woody shrub *Pentzia incana*, succulent shrub *Ruschia ferox* and perennial grass *Eragrostis lehmanniana*.

Appendix D

Erosion Management Sub-Plan

DRENNAN SOLAR ENERGY FACILITY

EROSION MANAGEMENT PLAN

PRODUCED FOR ERM

ON BEHALF OF SOLAIREDIRECT

BY

SIMON TODD CONSULTING
Simon.Todd@3foxes.co.za

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PURPOSE

The purpose of the Drennan Solar Energy Facility erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed facility. As part of the management plan, measures to protect hydrological features from erosion damage are included.

SCOPE & LIMITATIONS

This plan is intended at introducing measures aimed reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore issues such as the potential presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

RELEVANT ASPECTS OF THE SITE

The site is flat towards the Eskom power line and the rest of the site is gently to moderately sloping and there are no very steep areas within the development area that would be a high erosion risk area. The soils of the area are however quite vulnerable to erosion as the cover photograph illustrates. As the panels and other hardened surfaces of the site will generate a large amount of runoff during rainfall events, the risk or erosion even on gentle slopes is high. Consequently, specific measures to regulate runoff at the site should form part of the design and construction phases of the development.

BACKGROUND

Types of Erosion

Erosion comes in several forms, some of which are not immediately obvious. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the “bomb blast” effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results

in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill erosion

This is the removal of soil from the surface whereby small channels or rills up to 300mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc. This type of erosion usually occurs on lower slopes and at the site, it is likely to occur on the deeper soils which occur towards the drainage line which forms the southern boundary of the site.

Gully erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion which is not addressed. As with rill erosion, the southern boundary of the site is likely to pose the greatest risk for gully erosion.

Wind erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands. Given the high clay fraction in the soils at the site, it is not likely that wind erosion will be a significant influence at the site.

Given the slope and other characteristics of the site, the major types of erosion likely to be apparent at the site are sheet erosion and rill erosion, which if unchecked would lead to gully erosion.

Promoting Factors

Rainfall characterisitics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles. The site lies within the summer rainfall region of South Africa and as a result, is likely to receive the majority of rainfall as thunder showers with a moderate the high erosion potential. The panels, roads and other hardened surfaces are likely to generate large amounts of runoff during such events which would create a lot of erosion if not properly managed.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible. Soils at the site vary are relatively fine textured soils with a high clay content and are fairly erodible. In some areas, there is a stone mulch consisting of loose stones which cover the surface and reduce erodibility.

Length and steepness of slope

Steeper slopes cause runoff flow velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases. Given the relatively long consistent slope at the site from the top of the hill towards the bottom of the site, there is ample opportunity at the site for flow from different sources to accumulate and increase in erosive power.

Soil surface cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints.
2. Plan and integrate erosion and sediment control with construction activities.
3. Minimise the extent and duration of disturbance.
4. Control stormwater flows onto, through and from the site in stable drainage structures.
5. Use erosion controls to prevent on-site damage.

6. Use sediment controls to prevent off-site damage.
7. Control erosion and sediment at the source.
8. Stabilise disturbed areas promptly.
9. Inspect and maintain control measures.

ON-SITE EROSION MANAGEMENT

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

SPECIFIC RECOMMENDATIONS TO REDUCE EROSION POTENTIAL AND DEGRADATION OF WETLANDS AND DRAINAGE SYSTEMS

Although there are no large drainage lines within the development area itself, access roads and other infrastructure may impinge on such areas and precautions should be taken in these situations to reduce their potential impact.

Concentration of flows into downstream areas

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out

and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

Runoff Concentration

The increase in hardened surfaces associated with the panels, roads and other infrastructure, will lead to a significant increase in the volume and velocity of flow generated from these areas during large rainfall events.

- Runoff from road surfaces is usually channeled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

Diversion of flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom. Should the access road to the site traverse any major drainage lines, the following principles should apply.

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.

- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

Existing Erosion

- There is very little existing erosion within the site itself. The area towards the drainage line along the southern boundary of the site is however quite heavily impacted by erosion and therefore measures should be taken to ensure that any runoff from the site does not increase the erosion problems along the drainage line. There is a dam below the site in the drainage line and it is recommended that any runoff from the site is directed into the dam, rather than anywhere else.

MONITORING REQUIREMENTS

Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	**Indictor**	**Time frame**
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

Operational Phase

The following monitoring actions should be implemented during the operational phase of the development.

Monitoring Action	Indictor	Time frame
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually

CONCLUSIONS & RECOMMENDATIONS

- The upper parts of the site towards the top of the ridge have shallow stony soils and the high rock cover limits erosion potential in this area. The lower slopes have deeper soils and the erosion potential in this part of the site is high.
- Runoff generated in the upper parts of the site will accumulate towards the bottom of the site and if not adequately controlled will pose a high erosion risk in this vulnerable area.
- The facility will consist of many hectares of panels as well as service roads between the arrays. These will generate a lot of runoff, several magnitudes greater than the intact site currently generates. This must be managed adequately, especially with regards to the distribution and velocity of the runoff.
- Runoff from the site should be directed into its own evaporation pond or into the existing dam below the site. It should not be directed into the veld or into the drainage line below the site as this is likely to exacerbate existing erosion problems in those areas.

Appendix E

Stormwater Management Sub-Plan

E1 FRAMEWORK STORMWATER MANAGEMENT PLAN

E1.1 INTRODUCTION

The proposed PV power facility is located on the remaining extent of Farm Zeeven Fonteyen (Portion 15 of Farm No. 254), situated in the Inxuba Yethemba Local Municipality in the Eastern Cape. The site is located approximately 55 km north of Cradock and is accessible from the N10 (tarred road).

The proposed development will include PV panels that will occupy approximately 150 ha (1.5 km^2) of the site area in total. The footprint of PV arrays will be approximately 127 ha.

The current surface water features on the Graspan site include several small pans which correspond to the Highveld Salt Pans vegetation described by Mucina & Rutherford (2006), but only the larger pans are actually mapped by Mucina & Rutherford (2006).

Apart from the pans, there are no other drainage or mesic habitats present. The site is largely flat and combined with the low rainfall, drainage lines have not developed. During the ecological field survey, six small pans were identified and mapped (see *Annex F*). Of these, three have also been identified and mapped by the Freshwater Ecosystem Priority Areas (FEPAs) assessment produced by the CSIR (Nel et al. 2011). The pans identified under the FEPA, were however given a rank of 4 indicating that they are wetlands which are perceived to be in good condition and which occur in proximity to other such wetlands, but have not been identified by experts as priority wetlands.

Given the size of the site and the pans identified, it is important that storm water is appropriately managed to ensure potential impacts to these water bodies are mitigated. Storm water management measures are outlined below. However, the storm water management plan must be updated and refined once the construction / civil engineering plans have been finalised. The main objective of a Stormwater Management Plan is to control stormwater runoff from the proposed PV power facility. The framework plan is designed to improve the stormwater quality (i.e. sediment removal) and control runoff directly discharging from the site by providing a basis for a detailed storm water study to be undertaken prior to construction.

E1.2 LANDSCAPE AND TOPOGRAPHY

Slope, or terrain, is used to describe the lie of the land. In most cases, sloping land is subject to higher rates of water runoff and soil erosion (FAO, 2007). The topography of the area and proposed PV site are characterised by a flat and gently sloping topography with an average gradient of less than 10

percent. The terrain slopes up towards dolerite koppies around Klein Kareelaagte to the southeast of the project site.

E1.3 GEOLOGY AND SOILS

The geology of the Graspan site contains rocks of the Tierberg Formation, Ecca Group and the Karoo Supergroup, which are Early Permian in age (approximately 270 million years old). The geology of the farm is underlain by shale and tillite. Shale, a clastic sedimentary rock, underlies the southern and western portions of the site. Tillite, consisting of consolidated masses of unweathered blocks, is found to the northern and eastern parts of the site.

The entire site is underlain by red apedal soil types. Apedal soils lack well formed peds (1), other than porous micro-aggregates, and are weakly structured. Apedal soils tend to be freely drained, and the red colour generally signifies aeration in the upper solum. The entire study area is classified as having an effective soil depth (depth to which roots can penetrate the soil) of less than 0.4 m, which is a limiting factor in terms of sustainable crop production. The soils on site are associated with low organic matter content and a neutral pH.

Soil forms on the site include the Mispah, Glenrosa and Coega Forms, all of which exhibit a high erosion risks.

The area has an aquifer classification of minor, i.e. a moderately yielding aquifer system of variable water quality. The dissolved solids comprise between 301-500 mg/l.

(1) A ped is an individual natural soil aggregate (Soil Classification Working Group, 1991).

Mitigation and compliance monitoring measures required to be undertaken by Solaire Direct or the ECO, are presented in this section under the following headings:

- Pre-Construction Planning Phase;
- Construction Phase; and
- Operational Phase.

Mitigation and compliance monitoring measures listed in this section must be implemented by Solaire Direct during the various phases of the project.

Table 2.1 Framework Stormwater Management Measures

Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
No.	**Description**		**No.**	**Commitment / Actions Required / Key Controls**			
1	Permit Requirements	Ensure compliance with legal and other permitting requirements.	1.1 1.2	All necessary water related permits will be applied for at this stage and obtained from the relevant authorities. Oversee development of permits required by contractors.	Permits	Solaire Direct	Prior to construction
2	Detailed Stormwater Management Study	Assess in detail stormwater impacts and management measures	2.1	A detailed Stormwater Management Study will be undertaken at least three months prior to construction. The detailed Stormwater Management Study should include but not be limited to: • The hydrology of the site • Detailed analysis of runoff and drainage lines of the project site • The water runoff patterns pre- and post-PV panel installation • Potential impact from minor and major storm events • Detailed management measures for stormwater • Detailed monitoring measures	Detailed Stormwater Management Study	Solaire Direct	At least three months prior to construction
3	Road Drainage	Manage stormwater runoff from roads to mitigate potential erosion damage	3.1 3.2	Most roads on site will be gravel. Gravel roads should be graded and shaped with a 2 percent crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines and to assist with any sheet flow on the site Where roads intersect the natural, defined drainage lines, it is suggested that either suitably sized pipe culverts or drive-through causeways are installed or	Detailed civil engineering plans. ECO visual inspection.	Solaire Direct	Design and Construction

Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
No.	Description		No.	Commitment / Actions Required / Key Controls			
				constructed and should take into account hydrological criteria for a selected major storm, as assessed by the detailed Stormwater Management Study.			
4	PV Facility Drainage	Manage stormwater runoff from the PV panels to mitigate potential erosion damage	4.1	The total volume of stormwater run-off will increase due to vegetation clearance. Management in the form of stormwater channels and chutes will be required in order to direct the stormwater flows definitively and to minimize / control erosion.	Detailed civil engineering plans. ECO visual inspection.	Solaire Direct	Design and construction
5	Vegetation Restoration	Restore any vegetation on cleared areas as soon as possible in order to mitigate potential erosion and excess run-off	5.1	Areas that have been cleared of vegetation will be reseeded and restored with indigenous plants as soon as possible.	ECO visual inspection	Solaire Direct and Contractor	During construction if possible and immediately post-construction
6	Vegetation Filter Strips	Grass / vegetation filter strips act as a natural way of improving the quality of stormwater run-off from the site	6.1	Indigenous grassed filter strips are a low-cost good management practice designed to improve the quality of stormwater runoff by using biological and chemical processes in soils and vegetation filtering ability. The filter strips function by slowing runoff velocities and filtering out sediment and other pollutants, and providing some infiltration into underlying soils. It is recommended that areas under and within approximately 30m of the PV arrays be seeded with indigenous grass varieties. These plantings would act as grassed filter strips for the site. It is also recommended that filters be considered for the new access roads.	ECO visual inspection	Solaire Direct and Contractor	During construction if possible and immediately post-construction
7	Road Maintenance	Ensure public and internal roads are maintained	7.1	All internal and access roads that will be used during the construction and operation phase of the project will be	Visual Inspection by ECO	Solaire Direct	Throughout construction and operation

Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
No.	Description		No.	Commitment / Actions Required / Key Controls			
				maintained by Solaire Direct.			
			7.2	Solaire Direct will develop a policy and procedure for assessing all damages and maintenance to roads.	Policy outlining procedure for assessing damages and maintenance of roads		
8	Maintenance and Monitoring	Maintain mitigation measures for stormwater and monitor effectiveness of mitigation measures	8.1	Filter strips to be inspected frequently, especially after intense rainfall events and runoff events of long duration. It is important to note that small breaks in the filters and small erosion channels can quickly become problematic.	Record of monitoring. ECO visual inspection.	Solaire Direct	Throughout operation
			8.2	Minimize the development of erosion channels within the filter. Note that even small channels may allow much of the runoff from the site area to bypass the filter. If channels develop they should be repaired and reseeded immediately to help ensure controlled flow of runoff through the filter.			
			8.3	Reseed or inter-seed bare areas of the filter on a regular basis. As it may be difficult to re-establish vegetation in an established filter strip, the use of mulch or sods can help to reduce some problems.			
			8.4	Undertake soil tests periodically and apply amendment actions according to test results and recommendations.			

E3 FRAMEWORK STORAGE AND HANDLING OF HAZARDOUS SUBSTANCES PLAN

E3.1 INTRODUCTION

During the construction and operation of the Graspan PV Power Facility, petroleum products such as diesel and oil will be transported to the site and stored on site in Aboveground Storage Tanks (ASTs). An accidental spill or leak of such product could result in the contamination of soil and/ or groundwater. As such, the mitigation measures outlined below must be implemented during both the construction and operation phases to minimise this risk.

Safety training focused on operational procedures, emergency procedures and safe working practices, information on specific hazards, first aid and fire-fighting must be included in the induction, prior to the commencement of construction. Furthermore, relevant operational staff must receive training on the correct operation of storage tanks, as well as maintenance and repair procedures when leaks are detected.

E3.2 INSTALLATION OF ASTS AND STORAGE

The installation of the ASTs and storage of fuel must comply with South African National Standards (SANS) 10089-1. This includes, but is not limited to, the following:

- All atmospheric storage tanks shall be adequately vented to prevent, in the case of a cone-roof tank, the development of a vacuum or pressure that could distort the roof.
- ASTs within a bund should be arranged so that any fires in nearby tanks in the same or adjacent bunded areas, or in equipment or buildings nearby will have minimal effect on the ASTs.
- The capacity of the bunded area must not be less than the capacity of the largest AST in the bunded area.
- Bund walls may be constructed of earth or concrete, designed to be liquid-tight, and may not be covered with any material that will deteriorate under the effects of any petroleum product.
- No flammable or combustible products from draining water from bunded areas should be allowed to enter natural water courses.
- Service buildings must be located a distance from where products are stored and handled and out of the line of possible vapour travel (at least 15 m away in the case of Class I products and at least 6 m away in the case of Class II products).

- Hydrants and fire-fighting equipment must be so located that they can be approached from different directions, and distinctly marked that they can be easily seen.

- Adequate supplies of absorbents must be available on site at all times.

- Appropriate Health & Safety signage must be placed on and around the tank (in accordance with SANS standards).

- The tank area should be secured to prevent tampering and theft.

E3.3 TRANSPORTATION AND HANDLING OF DANGEROUS SUBSTANCES

During the time that the ASTs are in use, petroleum products will be delivered to site by a selected supplier. The supplier will be responsible for ensuring that the transport of fuel complies with SANS 10231 "*Transportation of dangerous goods - Operational requirements for road vehicles*". The following precautionary measures must be implemented at the site to reduce the risk of a spill or leak during the handling of petroleum products:

- No private vehicles must be used for the transportation of petroleum products.

- No vehicle will be left unattended while loading or unloading is in progress.

- A closed coupling device must be used when chemicals are being transferred from the delivery vehicle to the ASTs.

- Accidental movement of the vehicle must be prevented by ensuring that the vehicle's hand break is activated and the vehicle is in gear.

- All vehicle engines must be switched off before loading, and must only be restarted once all caps, valves and covers have been closed and secured.

- Vehicles waiting for loading must remain at a safe distance from the loading point in parking areas allocated for petroleum carrying vehicles.

- Special parking areas for bulk tankers shall be so designed that a large spill will not endanger the tank farm, buildings or any other structures.

- No smoking is permitted in the AST area. Smoking will only be permitted in designated areas, away from the ASTs.

- A list of spill response contact numbers should always be displayed in a prominent position on site and should include the following numbers:
  - Ambulance;
  - Nearest clinic / hospital;

- Fire brigade;
- Key regulatory authorities; and
- Supplier Customer Service Centre.

- Regular inspection of all pipes, tanks and other associated infrastructure must be undertaken to ensure there are no leaks.

- Accidental spills that occur outside of the bund area must be contained and prevented from entering the storm water system.

- Spills must be treated with the appropriate neutralising chemical or spill absorbent and, where necessary, spill absorbent must be removed by a certified hazardous waste removal company.

E3.4 MONITORING

Hazardous substance storage logs must be kept. Any incidents must be recorded. An environmental audit on the hazardous substance storage and handling documentation will be undertaken post-construction, and thereafter annually should hazardous substances be stored on site during operation of the PV power facility.

1 FRAMEWORK STORMWATER MANAGEMENT PLAN

1.1 INTRODUCTION

The proposed PV power facility is located on Portion 15, of Portion 1, of the Farm Waai Plaats (no. 550) at Drennan, situated in the Inxuba Yethemba Local Municipality in the Eastern Cape. 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 proposed development will include PV panels that will occupy approximately 110 ha (1.1 km^2) of the site area in total.

The major ecological feature at the Site is a large drainage system which traverses the area and is considered ecologically sensitive. The proposed development, although located outside of the drainage system, presents a risk to sensitivity receptors, particularly with regards to soil debris or waste run-off into the catchment areas surrounding drainage lines.

Given the size of the site and the drainage systems identified south of the PV footprint, it is important that storm water is appropriately managed to ensure potential impacts to these water bodies are mitigated. Storm water management measures are outlined below. However, the storm water management plan must be updated and refined once the construction / civil engineering plans have been finalised. The main objective of a Stormwater Management Plan is to control stormwater runoff from the proposed PV power facility. The framework plan is designed to improve the stormwater quality (i.e. sediment removal) and control runoff directly discharging from the site by providing a basis for a detailed storm water study to be undertaken prior to construction.

1.2 LANDSCAPE AND TOPOGRAPHY

The topography of the Study Area is a mix of open plains, riparian areas and steeper slopes. Slope, or terrain, is used to describe the lie of the land. Terrain influences climate, soils characteristics, and thus plays a dominant role in determining whether land is suitable for agriculture. In most cases sloping land is more difficult to cultivate and usually less productive than flatland, and is subject to higher rates of water runoff and soil erosion (FAO, 2007). Around 70 percent of the Site is dominated by steeper slopes and rocky outcrops. Away from these rocky areas the land is generally flat with an average gradient of less than 10 percent, these flatter areas are associated with a higher potential for grazing. The flat topography of the eastern portion of the Site makes this area ideal for the proposed development, as minimal earthworks will be required to prepare the Site for the installation of PV arrays.

1.3 GEOLOGY AND SOILS

The geology of the Study Area 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 Site is underlain by mudstone and Dolerite. 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. Dolerite geological materials underlie the central areas as well as the southern boundary of the Site (Barichievy, 2013).

According to the Environmental Potential Atlas (ENPAT) database, the Site is underlain by two soil groups. The steeper slopes, in the southern and western portions of the Site, are associated with shallow, rocky soils. The central portion and eastern area are dominated by Glenrosa and Mispah soil forms. These forms are also associated with shallow soils, where parent rock is found close to the land surface. These soils have an inherently lower water holding capacity. These soil forms also exhibit moderately high soil erosion hazard ratings. The riparian zones to the east of the Site are associated with deeper soils and rich alluvial deposits. These areas are characterised by moderate soil depths of between 0.45 and 0.75 m (Barichievy, 2013).

The major soil forms identified during the field survey include the Mispah, Glenrosa, Swartland, and Coega, all of which exhibnit a high erosion risk. Other soils encountered during the field survey, which were recorded very sparsely across the Site and therefore not fully described below, include the Mayo (Melanic A, Lithocutanic B).

The aquifer type for the proposed Site is classified as fractured and would likely have a borehole yield of 0.5 to 2.0l/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).

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

2 SPECIFIC STORMWATER MANAGEMENT MITIGATION

Mitigation and compliance monitoring measures required to be undertaken by Solaire Direct or the ECO, are presented in this section under the following headings:

- Pre-Construction Planning Phase;
- Construction Phase; and
- Operational Phase.

Mitigation and compliance monitoring measures listed in this section must be implemented by Solaire Direct during the various phases of the project.

Table 2.1 Framework Stormwater Management Measures

Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
No.	**Description**		**No.**	**Commitment / Actions Required / Key Controls**			
1	Permit Requirements	Ensure compliance with legal and other permitting requirements.	1.1 1.2	All necessary water related permits will be applied for at this stage and obtained from the relevant authorities. Oversee development of permits required by contractors.	Permits	Solaire Direct	Prior to construction
2	Detailed Stormwater Management Study	Assess in detail stormwater impacts and management measures	2.1	A detailed Stormwater Management Study will be undertaken at least three months prior to construction. The detailed Stormwater Management Study should include but not be limited to: • The hydrology of the site • Detailed analysis of runoff and drainage lines of the project site • The water runoff patterns pre- and post-PV panel installation • Potential impact from minor and major storm events • Detailed management measures for stormwater • Detailed monitoring measures	Detailed Stormwater Management Study	Solaire Direct	At least three months prior to construction
3	Road Drainage	Manage stormwater runoff from roads to mitigate potential erosion damage	3.1 3.2	Most roads on site will be gravel. Gravel roads should be graded and shaped with a 2 percent crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines and to assist with any sheet flow on the site Where roads intersect the natural, defined drainage lines, it is suggested that either suitably sized pipe culverts or drive-	Detailed civil engineering plans. ECO visual inspection.	Solaire Direct	Design and Construction

Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
No.	Description		No.	Commitment / Actions Required / Key Controls			
				through causeways are installed or constructed and should take into account hydrological criteria for a selected major storm, as assessed by the detailed Stormwater Management Study.			
4	PV Facility Drainage	Manage stormwater runoff from the PV panels to mitigate potential erosion damage	4.1	The total volume of stormwater run-off will increase due to vegetation clearance. Management in the form of stormwater channels and chutes will be required in order to direct the stormwater flows definitively and to minimize / control erosion.	Detailed civil engineering plans. ECO visual inspection.	Solaire Direct	Design and construction
5	Vegetation Restoration	Restore any vegetation on cleared areas as soon as possible in order to mitigate potential erosion and excess run-off	5.1	Areas that have been cleared of vegetation will be reseeded and restored with indigenous plants as soon as possible.	ECO visual inspection	Solaire Direct and Contractor	During construction if possible and immediately post-construction
6	Vegetation Filter Strips	Grass / vegetation filter strips act as a natural way of improving the quality of stormwater run-off from the site	6.1	Indigenous grassed filter strips are a low-cost good management practice designed to improve the quality of stormwater runoff by using biological and chemical processes in soils and vegetation filtering ability. The filter strips function by slowing runoff velocities and filtering out sediment and other pollutants, and providing some infiltration into underlying soils. It is recommended that areas under and within approximately 30m of the PV arrays be seeded with indigenous grass varieties. These plantings would act as grassed filter strips for the site. It is also recommended that filters be considered for the new access roads.	ECO visual inspection	Solaire Direct and Contractor	During construction if possible and immediately post-construction
7	Road Maintenance	Ensure public and internal roads are	7.1	All internal and access roads that will be used during the construction and	Visual Inspection by ECO	Solaire Direct	Throughout construction

Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
No.	Description		No.	Commitment / Actions Required / Key Controls			
		maintained		operation phase of the project will be maintained by Solaire Direct.			and operation
			7.2	Solaire Direct will develop a policy and procedure for assessing all damages and maintenance to roads.	Policy outlining procedure for assessing damages and maintenance of roads		
8	Maintenance and Monitoring	Maintain mitigation measures for stormwater and monitor effectiveness of mitigation measures	8.1	Filter strips to be inspected frequently, especially after intense rainfall events and runoff events of long duration. It is important to note that small breaks in the filters and small erosion channels can quickly become problematic.	Record of monitoring. ECO visual inspection.	Solaire Direct	Throughout operation
			8.2	Minimize the development of erosion channels within the filter. Note that even small channels may allow much of the runoff from the site area to bypass the filter. If channels develop they should be repaired and reseeded immediately to help ensure controlled flow of runoff through the filter.			
			8.3	Reseed or inter-seed bare areas of the filter on a regular basis. As it may be difficult to re-establish vegetation in an established filter strip, the use of mulch or sods can help to reduce some problems.			
			8.4	Undertake soil tests periodically and apply amendment actions according to test results and recommendations.			

Appendix F

Framework Storage and Handling of Hazardous Substances Sub-Plan

F1 FRAMEWORK STORAGE AND HANDLING OF HAZARDOUS SUBSTANCES PLAN

F1.1 INTRODUCTION

During the construction and operation of the Graspan PV Power Facility, petroleum products such as diesel and oil will be transported to the site and stored on site in Aboveground Storage Tanks (ASTs). An accidental spill or leak of such product could result in the contamination of soil and/ or groundwater. As such, the mitigation measures outlined below must be implemented during both the construction and operation phases to minimise this risk.

Safety training focused on operational procedures, emergency procedures and safe working practices, information on specific hazards, first aid and fire-fighting must be included in the induction, prior to the commencement of construction. Furthermore, relevant operational staff must receive training on the correct operation of storage tanks, as well as maintenance and repair procedures when leaks are detected.

F1.2 INSTALLATION OF ASTS AND STORAGE

The installation of the ASTs and storage of fuel must comply with South African National Standards (SANS) 10089-1. This includes, but is not limited to, the following:

- All atmospheric storage tanks shall be adequately vented to prevent, in the case of a cone-roof tank, the development of a vacuum or pressure that could distort the roof.
- ASTs within a bund should be arranged so that any fires in nearby tanks in the same or adjacent bunded areas, or in equipment or buildings nearby will have minimal effect on the ASTs.
- The capacity of the bunded area must not be less than the capacity of the largest AST in the bunded area.
- Bund walls may be constructed of earth or concrete, designed to be liquid-tight, and may not be covered with any material that will deteriorate under the effects of any petroleum product.
- No flammable or combustible products from draining water from bunded areas should be allowed to enter natural water courses.
- Service buildings must be located a distance from where products are stored and handled and out of the line of possible vapour travel (at least 15

m away in the case of Class I products and at least 6 m away in the case of Class II products).

- Hydrants and fire-fighting equipment must be so located that they can be approached from different directions, and distinctly marked that they can be easily seen.

- Adequate supplies of absorbents must be available on site at all times.

- Appropriate Health & Safety signage must be placed on and around the tank (in accordance with SANS standards).

- The tank area should be secured to prevent tampering and theft.

F1.3 TRANSPORTATION AND HANDLING OF DANGEROUS SUBSTANCES

During the time that the ASTs are in use, petroleum products will be delivered to site by a selected supplier. The supplier will be responsible for ensuring that the transport of fuel complies with SANS 10231 "*Transportation of dangerous goods - Operational requirements for road vehicle*s". The following precautionary measures must be implemented at the site to reduce the risk of a spill or leak during the handling of petroleum products:

- No private vehicles must be used for the transportation of petroleum products.

- No vehicle will be left unattended while loading or unloading is in progress.

- A closed coupling device must be used when chemicals are being transferred from the delivery vehicle to the ASTs.

- Accidental movement of the vehicle must be prevented by ensuring that the vehicle's hand break is activated and the vehicle is in gear.

- All vehicle engines must be switched off before loading, and must only be restarted once all caps, valves and covers have been closed and secured.

- Vehicles waiting for loading must remain at a safe distance from the loading point in parking areas allocated for petroleum carrying vehicles.

- Special parking areas for bulk tankers shall be so designed that a large spill will not endanger the tank farm, buildings or any other structures.

- No smoking is permitted in the AST area. Smoking will only be permitted in designated areas, away from the ASTs.

- A list of spill response contact numbers should always be displayed in a prominent position on site and should include the following numbers:
  - Ambulance;
  - Nearest clinic / hospital;
  - Fire brigade;
  - Key regulatory authorities; and
  - Supplier Customer Service Centre.

- Regular inspection of all pipes, tanks and other associated infrastructure must be undertaken to ensure there are no leaks.

- Accidental spills that occur outside of the bund area must be contained and prevented from entering the storm water system.

- Spills must be treated with the appropriate neutralising chemical or spill absorbent and, where necessary, spill absorbent must be removed by a certified hazardous waste removal company.

F1.4 MONITORING

Hazardous substance storage logs must be kept. Any incidents must be recorded. An environmental audit on the hazardous substance storage and handling documentation will be undertaken post-construction, and thereafter annually should hazardous substances be stored on site during operation of the PV power facility.

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1.1 INTRODUCTION

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- Service buildings must be located a distance from where products are stored and handled and out of the line of possible vapour travel (at least 15

m away in the case of Class I products and at least 6 m away in the case of Class II products).

- Hydrants and fire-fighting equipment must be so located that they can be approached from different directions, and distinctly marked that they can be easily seen.

- Adequate supplies of absorbents must be available on site at all times.

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- All vehicle engines must be switched off before loading, and must only be restarted once all caps, valves and covers have been closed and secured.

- Vehicles waiting for loading must remain at a safe distance from the loading point in parking areas allocated for petroleum carrying vehicles.

- Special parking areas for bulk tankers shall be so designed that a large spill will not endanger the tank farm, buildings or any other structures.

- No smoking is permitted in the AST area. Smoking will only be permitted in designated areas, away from the ASTs.

- A list of spill response contact numbers should always be displayed in a prominent position on site and should include the following numbers:
  - Ambulance;
  - Nearest clinic / hospital;
  - Fire brigade;
  - Key regulatory authorities; and
  - Supplier Customer Service Centre.

- Regular inspection of all pipes, tanks and other associated infrastructure must be undertaken to ensure there are no leaks.

- Accidental spills that occur outside of the bund area must be contained and prevented from entering the storm water system.

- Spills must be treated with the appropriate neutralising chemical or spill absorbent and, where necessary, spill absorbent must be removed by a certified hazardous waste removal company.

1.4 MONITORING

Hazardous substance storage logs must be kept. Any incidents must be recorded. An environmental audit on the hazardous substance storage and handling documentation will be undertaken post-construction, and thereafter annually should hazardous substances be stored on site during operation of the PV power facility.

Appendix G

Traffic and Transport Management Sub-Plan

1 TRAFFIC AND TRANSPORT MANAGEMENT PLAN

1.1 INTRODUCTION

During the construction of the Drennan PV Power Facility, PV components will be delivered to site using road transport. 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. The purpose of a Traffic Management Plan (TMP) is to minimise the potential traffic related incidences on the project site, as well as impact of project related traffic on other road users and people living along transport routes.

The Drennan PV Power Facility is still in the early planning phase, therefore contractors and the final route from port to site has not yet been confirmed. A detailed Traffic and Transport Study covering this aspect will be undertaken at least three months prior to construction and the findings and any additional mitigation measures should be incorporated into this TMP.

1.2 OBJECTIVES OF THE TMP

The TMP has the following objectives:

- Provide an overview of the project site, associated activities, and key project activities influencing traffic and transport;
- Provide a framework description and plan of the traffic and transport management elements involved with undertaking the construction and operation of the proposed project;
- Provide a structure within which Solaire Direct can further develop more detailed traffic and transport plans as a result of a detailed traffic and transport study; and
- Serve as key management and mitigation measures that are adopted by Solaire Direct, and receive final approval from relevant authorities.

1.3 LEGAL REQUIREMENTS

Due to the size and quantity of components, trucks will be used to deliver components. It is not anticipated that trucks carrying large enough loads to be considered abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) will be required. If such loads are required to be used, a permit for a vehicle carrying an abnormal load must be obtained from the relevant Provincial Authority. The vehicle must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads, issued by the Department of Transport, 2009.

1.4 SITE ACCESS

The site will be accessed from the R390 road at the existing site entrance (32°26'17.12"S 25°44'12.91"E). An existing gravel road on the western side of the railway line will be upgraded to approximately 6 m in width, and used to cross the railway line. The railway line crossing will be upgraded to decrease the slope to between 26-45 degrees and 5 m width on either side of the railway line. The existing gravel road on the east side of the railway line running south will be used and upgraded to approximately 6 m in width in order to reach the PV power facility's direct footprint. Internal paths will be created to enable access within the PV power facility.

Within the PV arrays, a minimum spacing of 6.2 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.

1.5 VEHICLE MOVEMENTS

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.

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

It is therefore expected that up to 1649 vehicle movements would be required to deliver the PV components and remove the earthworks to a landfill site over the construction period. The construction will, however, be phased and the above mentioned vehicle movements will be spread throughout the construction period of 18 to 24 months. During the construction phase of the project, increases in traffic levels would be intermittent and temporary in nature.

During the construction phase, up to 291 workers would also have to travel to and from the site on a daily basis.

Once all phases are operational, there would be an operations team comprising of full time personnel. These employees would have to commute to and from the site on a daily basis. During the operational phase, it is expected that potential traffic impacts will be reduced, with vehicles only required to transport infrastructure during routine maintenance and upgrading phases. Potential traffic impacts associated with the operation of the facility would be largely limited to the site and the local access road.

1.6 *DAILY TRAFFIC MOVEMENTS*

Considering the total schedule of vehicle movements to the site and likely construction period, it is estimated that typical daily traffic movements will be minimal.

The peak period for construction deliveries will be related to the construction of the PV framework and panel assembly. Considering the total number of deliveries expected, it is anticipated that a maximum of approximately 10 truck deliveries per day will take place.

1.7 *PROPOSED WORKING HOURS*

It is anticipated that the working hours for construction and operation will be standard working hours from 08:00 to 17:00, Monday to Friday.

1.8 *PARKING*

In order to ensure efficient movement of traffic along the site access roads it is proposed that a parking area will be provided within the site, adjacent the guardhouses.

1.9 *SITE DELIVERY ROUTE*

All project components will be sourced from Cape Town in the Western Cape. The most likely delivery route is outlined below and can be seen in *Figure 1.1*.

Project components will leave Cape Town and travel north east on the N1 national road to Beaufort West. From Beaufort West the route will continue north east on the N1 to Three Sisters. At Three Sisters the route heads north on the N12 through Victoria West and Britstown to Hopetown. From Hopetown the route carries on north east on the N12 to the Drennan site. The site will be accessed from the N12.

Figure 1.1 Proposed Transport Route

2 SPECIFIC TRAFFIC AND TRANSPORT MANAGEMENT MITIGATION

Mitigation and compliance monitoring measures required to be undertaken by Solaire Direct or the ECO, are presented in this section under the following headings:

- Pre-Construction Planning Phase;
- Construction Phase; and
- Operational Phase.

Mitigation and compliance monitoring measures listed in this section must be implemented by Solaire Direct during the various phases of the project. These measures are based on best practice and specialist recommendations to minimise impacts on the Drennan site.

Table 9.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
1	Permit Requirements	Ensure compliance with legal and other permitting requirements.	1.1	All necessary transportation permits will be applied for at this stage and obtained from the relevant authorities, including permits for abnormal loads if required.	Permits	Solaire Direct	Prior to construction
			1.2	Oversee development of permits required by contractors.			
2	Transport routes	Ensure the selection of the most suitable route from Cape Town to site.	2.1	A transport study must be undertaken at least three months prior to construction.	Traffic and Transport Study	Solaire Direct	Prior to construction
3	Site layout and laydown area	Ensure that layout of the laydown area and temporary construction camp allow for ease of vehicle movement.	3.1	The layout of the construction camp must allow for sufficient space for vehicles to turn on site and avoid the need to reverse as far as possible.	Engineering drawings	Solaire Direct	Prior to construction
			3.2	Ensure potential blind spots are eliminated when layout is being finalised.			
			3.3	Ensure adequate crossing points (roads and delivery zones) for pedestrians are indicated in the final layout.			
			3.4	Ensure storage areas, particularly Above Ground Storage Tanks (ASTs), are protected from potential impacts with vehicles.			
			3.5	Ensure adequate parking exists on site for all construction vehicles.			
			3.6	Internal roads must have adequate turning circles and over taking zones for delivery vehicles.			

Table 9.2 CONSTRUCTION AND OPERATION PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
1	Driver Education	To ensure all drivers are aware of driving protocols and familiar with the TMP.	1.1	Driver education must be included in the contractor's induction process.	Induction	Contractor	Prior to construction
			1.2	A copy of the TMP must be readily available on site at all times.	TMP on site		
2	Route Management	To minimise risk to other road users and residents along the transport route.	2.1	Prior to the transport of abnormal loads, if required, the hauler must liaise with local authorities, police and emergency services to ensure they are aware of the abnormal load movements.	Proof of communication	Contractor / Haulier	Prior to transportation
			2.2	Any conditions given in the abnormal load permit must be adhered to (if required).	Abnormal Load Permit (if required)	Contractor	During construction
			2.3	Construction vehicles must obey all road signs on public roads.			During construction
3	On site driving	To minimise risks to drivers and other site users while vehicles are moving on site.	3.1	The vehicles of the contractor and his suppliers shall not exceed a speed of 40 km / h on gravel or earth roads on site and within 500m of the site.	Grievance Procedure	Contractor	During construction and operation
			3.2	One way systems must be implemented to ensure the flow of vehicles and to reduce the need to reverse vehicles.			During construction and operation
			3.3	All vehicle traffic routes must be kept clear of obstruction.			During construction and operation
			3.4	Ensure suitable signage to warn pedestrians about vehicle movements are clearly visible in appropriate zones, such as delivery zones.			During construction and operation
			3.5	Ensure vehicle reverse warning lights and			

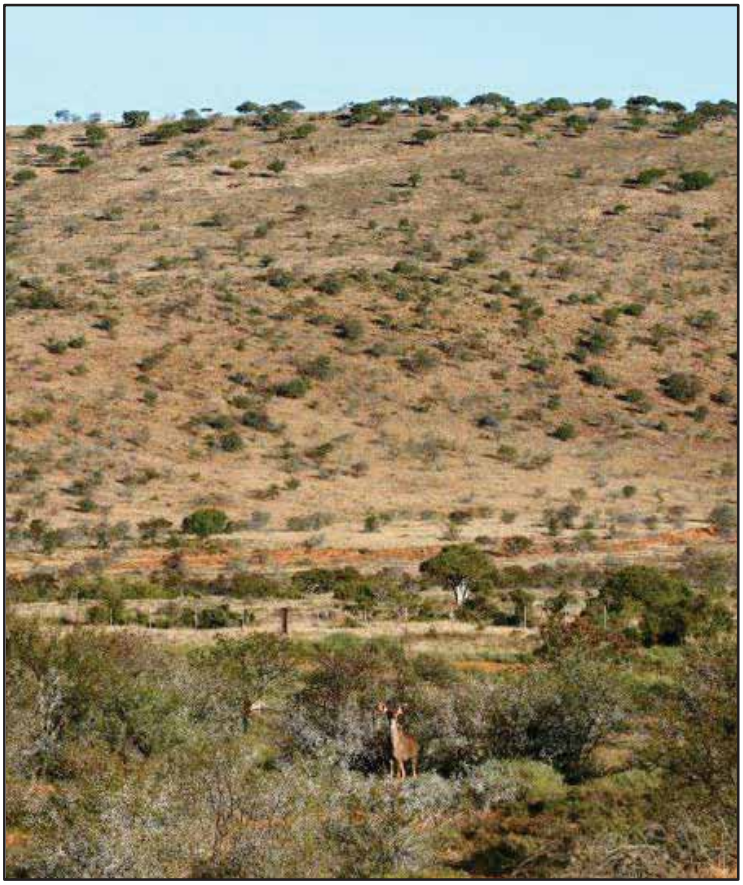
Table 9.2 CONSTRUCTION AND OPERATION PHASE							
Aspect		Objective	Actions to be undertaken to Mitigate Environmental Impact		Parameters for Monitoring	Responsibility	Frequency / Timing
#	Description of Aspect		#	Commitment / Actions Required / Key Controls			
				alarms are in working order.			During construction and operation
4	Deliveries	Minimise potential risks during deliveries to the site.	4.1 4.2 4.3	Deliveries must be limited to working hours. Prior notice must be given for abnormal load deliveries to ensure that adequate staff are available to guide vehicles. Deliveries should be scheduled to prevent congestion on site.	Log of deliveries and timing	Solaire Direct and Contractor	Through construction and operation
5	Lighting	Reduce the potential impact of lighting on other road users.	5.1	Any security lighting at the contractor's camp is to be placed in such a way as to not cause a nuisance to traffic on adjacent roads.	Grievance Procedure	Contractor	During construction
6	Road Maintenance	Ensure public and internal roads are maintained and losses are compensated for.	6.1 6.2	All internal and access roads that will be used during the construction and operation phase of the project will be maintained by Solaire Direct. Solaire Direct will develop a policy and procedure for assessing all damages and losses (e.g. damage to property, injury or death of people or livestock) resulting from project vehicles.	Visual Inspection by ECO Policy outlining procedure for assessing and compensation for damages due to project vehicles.	Solaire Direct	Throughout construction and operation

Appendix H

Open Space Management Sub-Plan

DRENNAN SOLAR ENERGY FACILITY

OPEN SPACE MANAGEMENT PLAN



PRODUCED FOR ERM

ON BEHALF OF SOLAIREDIRECT

BY

SIMON TODD CONSULTING

Simon.Todd@3foxes.co.za

JUNE 2013

PURPOSE

The purpose of the Drennan Solar Energy Facility Open Space Management Plan is to provide a framework for the integrated management of the natural and semi-natural areas within the Drennan Energy Facility.

PROBLEM OUTLINE

The Drennan Solar Energy facility is approximately 110 ha in extent. There are no unused areas within the development area and the only "open spaces" within the facility will be the spaces between the arrays of panels and the areas beneath the panels themselves. However, the area contains a number of listed plant species and the management of the vegetation within the facility will impact the biodiversity within the facility itself as well as in the adjacent areas in the case of inappropriate management. The purpose of the plan is therefore to ensure that the facility operates in a biodiversity compatible manner and does not have a long-term negative impact on the local environment.

RELATION TO OTHER SUBPLANS

Given that the goal of the Open Space Management Subplan is to ensure the biodiversity compatible management of the facility, it cannot be considered independently of the other environmental management subplans at the site. In particular the Erosion Management Subplan and Alien Invasive Management Subplan should be closely aligned with the Open Space Management Subplan.

OPEN SPACE MANAGEMENT SUBPLAN

The following elements are considered part of the Open Space Management Subplan

Access Control:

- Access to the facility should be strictly controlled.
- All visitors and contractors should be required to sign-in.
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

Prohibited Activities:

The following activities should not be permitted by anyone except the landowner or his representatives:

- No fires within the site.
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.

- No driving off of demarcated roads.
- No interfering with livestock.

Fire Risk Management:

Although fires are not a natural occurrence at the site, fires may occasionally occur under the right circumstances, such as following exceptional summer rainfall, when grass biomass may reach sufficient density to carry a fire. Ignition risk sources in the area include the following:

- Lightning strikes
- Personnel within the facility dropping cigarettes or other activities which pose a fire risk.
- Electrical shorts

The National Veld and Forest Fires Act places responsibility on the landowner to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Therefore, the management of the facility should ensure that they have suitable equipment as well as trained personnel available to assist in the event of fire.

Firebreaks

Extensive firebreaks are not recommended as a fire-risk management strategy at the site. In the majority of years there is not sufficient biomass to carry a fire and the risk of fire is very low. In addition, the service roads around the facility will serve to break up the connectivity of the vegetation within the facility and would serve as fire breaks which would also retard the spread of fire around the site. Should a fire break around the perimeter of the facility be required, a strip of vegetation 5-10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However if alien species such as *Salsola kali* colonise these areas, more regular clearing should be implemented.

Grazing Management

In the absence of livestock grazing, the biomass within the facility will build up which may not be desirable for biodiversity or the management of the facility. The simplest and most ecologically sound way to reduce the biomass within the facility would be through the use of livestock grazing. Small stock such as sheep are compatible with solar energy facilities and are commonly grazed within such facilities as they do not pose a danger to the electrical or other infrastructure of the facility. In order to reduce the biomass within the facility, it could be grazed once or twice a year, depending on the rainfall.

Alien Plant Control

Alien invasive plants should be controlled according to the Alien Invasive Management Plan. However, it is important to point out that the vegetation of the facility should comprise indigenous species and that a high abundance of alien species at the site, will impact biodiversity within the site itself as well as within the surrounding areas as the site will constitute a source of alien seed and propagules. Disturbance at the site will encourage alien species and vegetation management at the site, should be

done using livestock or manual clearing. In areas where vegetation height needs to be controlled, plants should not be cleared to ground level, but should be cleared to no less than 20 cm above ground level. Unless manual methods are not effective, no herbicides should be used to control alien species.

Erosion Management

The facility should be inspected every 6 months for erosion problems or more frequently in the event of exceptional rainfall events. All erosion problems should be rectified according to the Erosion Management Subplan.

Integrated Management

The management of the facility should meet with the landowner and other relevant local managers to review the management of the facility on a regular basis. Records of such meetings should be maintained including decisions and management outcomes resulting from such meetings.

CONCLUSIONS

The Drennan site is not very large and the majority of the facility will be under infrastructure. As a result, the open spaces of the facility will comprise the minority of the area. Ideally, the areas between and under the arrays should be left intact and the entire development area should not be cleared prior to construction. This will greatly increase the residual biodiversity within the facility as well as reduce the amount of active management required during the operation of the facility. The primary purpose of the open space management plan should be to maintain the vegetation of the site in a state which does not comprise a high proportion of alien species and which can still support the majority of smaller fauna which inhabit the area. This is best achieved through ensuring that the vegetation of the site consists of natural species and that management of the vegetation is largely through natural means such as livestock grazing.