SKUITDRIFT 1 SOLAR PV ENERGY FACILITY, NEAR AUGRABIES, NORTHERN CAPE PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME: REVISION 1

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

The following definitions and terminology may be applicable to this project and may occur in the report below:

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

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

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

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per Regulations GNR 983, 984 and 985 of December 2014. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

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

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

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

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

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

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

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

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

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental Control Officer (ECO): An individual appointed by the Owner prior to the commencement of any authorised activities, responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation

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

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

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

Environmental management programme: A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

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

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

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

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Project development property: The project development areas considered through the EIA process in defining the area for the PV facility project include, and are defined as follows:

» **Broader study area:** The broader study area refers to the 45ha of the Farm Skuitdrif 426. The entire 45ha of the project site was subjected to the basic assessment in order to provide the option of identifying more suitable positions for development of the PV facility, should any of the areas be found to be technically or environmentally constrained.

» **Development footprint:** The development footprint of the proposed PV facility, including associated infrastructure is situated in the south eastern extent of the broader study area, and is ~19ha in extent.

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

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

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

Vulnerable species: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*.

ABBREVIATIONS

The following abbreviations may be applicable to this project and may occur in the report below:

AIA	Archaeological Impact Assessment
BGIS	Biodiversity Geographic Information System
CDSM	Chief Directorate Surveys and Mapping
CEMP	Construction Environmental Management Plan
DBAR	Draft Basic Assessment Report
DEA	Department of Environmental Affairs
DME	Department of Minerals and Energy
EAP	Environmental Impact Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
KNP	Karoo National Park
KOP	Key Observation Point
kV	Kilo Volt
LAeq,T	Time interval to which an equivalent continuous A-weighted sound level
LLRC	Low Level River Crossing
LUDS	Land Use Decision Support
LUPO	Land Use Planning Ordinance
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NID	Notice of Intent to Develop
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
PIA	Paleontological Impact Assessment
PM	Post Meridiem; "Afternoon"
SACAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework

SMME	Small, Medium and Micro Enterprise
SAPD	South Africa Police Department

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CHAPTER 1: INTRODUCTION

Scuitdrift Solar Project Pty (Ltd) (Herein referred to as "The Developer"), is proposing the development of a photovoltaic (PV) solar energy facility on the Farm Skuitdrif 426 near Augrabies in the Northern Cape Province. The proposed project, referred to as the "Skuitdrift 1 Solar PV Energy Facility**"**, will have a contracted capacity of no more than 5 megawatts (MW). The proposed site is located approximately 50 km north west of Augrabies (refer to **Figure 1**) and falls under the jurisdiction of the Kai!-Garib Local Municipality and within the ZF Mgcawu District Municipality in the Northern Cape Province.

The EMPr has been developed on the basis of the findings of the EIA, and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all **Scuitdrift Solar Project Pty (Ltd)** employees and contractors working on the pre-construction, construction, and operation and maintenance phases of this project. The document will be adhered to, updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations and forms part of the EIA Report for the project.

This is the first revision (i.e. Revision 1) of the Skuitdrift 1 Solar PV Energy Facility EMPr, as approved in the Environmental Authorisation, dated 23 March 2017. The objective of the revision is to ensure that the EMPr is in line with the requirements as stated in the Environmental Authorisation, as well as to include the findings of the ecology and heritage walk-through reports. The final layout of the facility is also included as part of this revision.

The Skuitdrift 1 Solar PV Energy Facility was awarded preferred bidder status under the second round of the Small Projects IPP Procurement Programme of the Department of Energy in 2017. Construction of the facility is expected to commence shortly after financial close.

CHAPTER 2: PROJECT DETAILS

2.1 Project Details

Scuitdrift Solar Project (Pty) Ltd is proposing the development of a photovoltaic (PV) solar energy facility on Farm Skuitdrif 426 near Augrabies in the Northern Cape Province. An environmental authorisation was issued in terms of the EIA Regulations, 2014 on 23 March 2017.

The broader study area (i.e. 45ha) has been considered through a basic assessment process of the EIA process, within which the development footprint for the PV facility (approximately 19ha in extent) has been appropriately located. Based on the specialist studies and limited field survey undertaken during the basic assessment process, sensitivities were identified within the project site which could potentially be impacted on by the development of the Skuitdrift 1 Solar PV Energy Facility.

The proposed project will have a contracted capacity of no more than 5MW. The Northern Cape is generally known to be one of the most preferred areas for the generation of solar energy in South Africa due to the abundant solar radiation. The purpose of this project is to generate electricity from a renewable energy source (i.e. solar radiation) to provide power to the national electricity grid. The proposed development site is located within the Kai!-Garib Local Municipality and the ZF Mgcawu District Municipality, 50km north west of Augrabies, in the Northern Cape Province (refer to **Figure 1**).

The identified ~19ha development footprint is located on the Farm Skuitdrif 426, totalling an extent of ~8000ha. The area is located directly adjacent to the existing Schuitdrift 132/33kV Eskom substation, which is situated on the same farm. The Skuitdrift 1 Solar PV Energy Facility is to be developed by **Scuitdrift Solar Project (Pty) Ltd** and has received preferred bidder status under the Small Projects IPP Procurement Programme's second round in 2017, from the Department of Energy.

The identified development footprint will have permanent and temporary infrastructure with an approximate footprint of 19ha, including:

- A small site office (10m x 10m), and storage facility (20m x 10m), including security and ablution facilities (20m x 20m);
- A lay-down area;
- 10kL rain water tanks;
- Inverter stations (built within transporter containers, 25m² in size);
- A grid connection substation and transformers;
- A new overhead 33kV power line of ~ 630m;
- Underground cabling to run the length of the arrays and link the arrays to inverters;
- The main re-aligned access road;
- Service roads which will run between the rows of arrays; and
- Parameter fencing around the solar facility.

Additional auxiliary electrical equipment includes:

- 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; and
» Air-conditioning equipment inside inverter/transformer enclosures which will regulate the operating temperature of the inverters.

A summary of the technical specification of the PV Facility is shown below.

Component	**Description/ Dimensions**
Location of the site	Farm Skuitdrif 426
Municipal Jurisdiction	Kai!-Garib Local Municipality which falls within the jurisdiction of the ZF Mgcawu District Municipality
Ward number	9
SG Code	C0360000000042600000
Nearest Town	~ 50km north west of Augrabies ~ 75km North East of Pofadder ~ 80km North West of Kakamas
Site Co-ordinates (centre of site)	28°36'51.75"S and 19°46'50.16"E
Contracted capacity of the facility	5 MW
Details of the PV infrastructure	Panel dimensions: 1.956 x 0.992m (330WP) Final Height of installed panels from the ground: 3 – 4 Height of inventers: 2.5m Height of transformers: 2.5m
Extent of broader study area	~45 ha
Extent of the development footprint	~19 ha
Internal access roads	< 4m wide and will be limited to the construction site only
Site access	Main Eskom access gate at co-ordinates 28°36'28.59"S and 19°48'33.88"E
Services required	» Water will be sourced/from one on-site Borehole pump and 10kL Rain water tanks. One existing borehole is situated on the site, and is considered as the preferred water source for the facility. The borehole closest to the site, Rooidraai, has a yield of approximately 70kl of potable quality water per day. » Refuse material disposal - all refuse material generated from the proposed development will be collected by a contractor and will be disposed of at the Kai!Garib Solid Waste Facilities located off site. This service will be arranged with the municipality and suitable contractors when required. » Sanitation – all sewage waste will be collected by a contractor and will be disposed of at the Kai!Garib Solid Waste Facilities during the construction phase. This service will be arranged with the municipality when required during the operation phase.

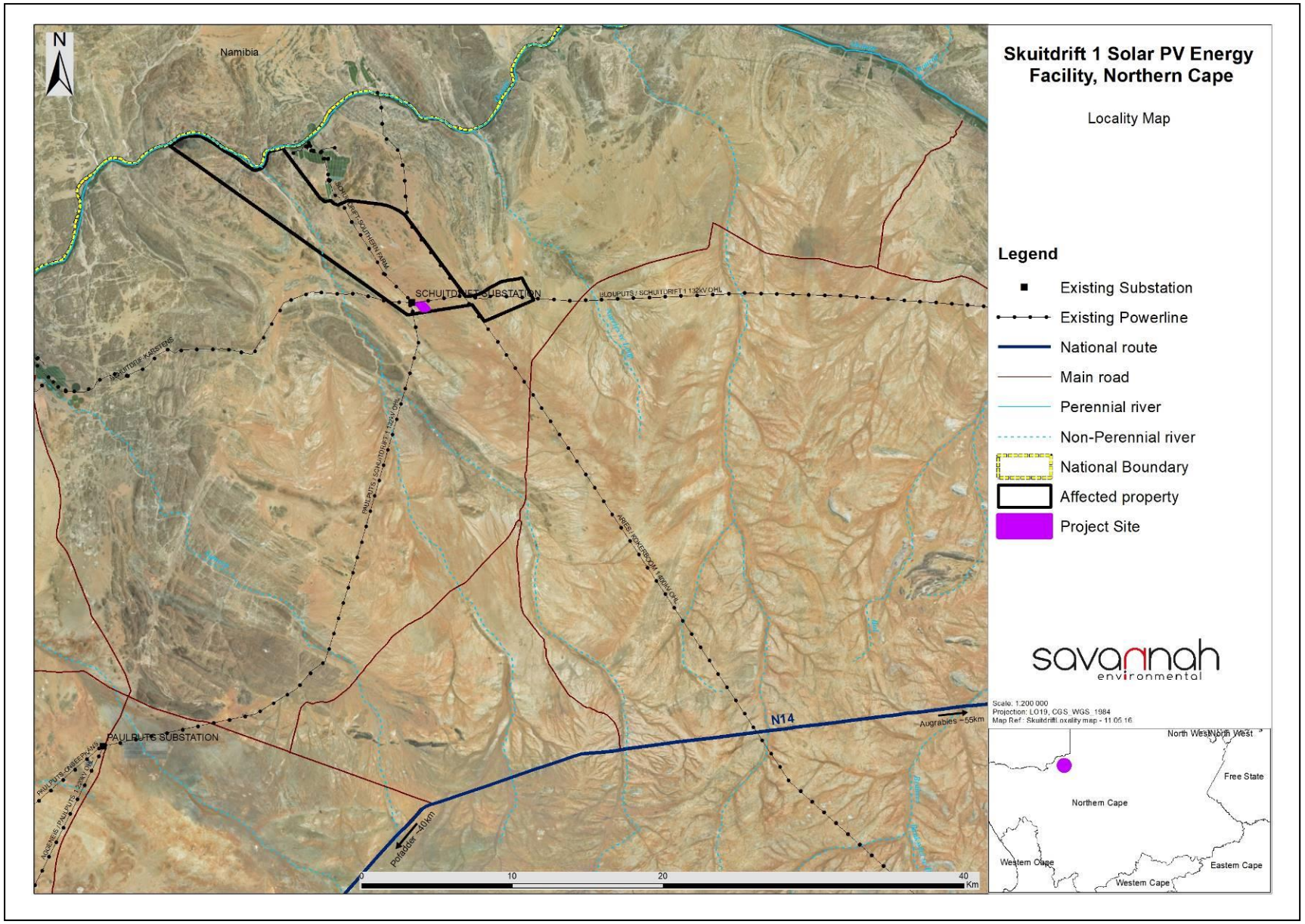

Figure 1: Map indicating the locality of the Skuitdrift 1 Solar PV Energy Facility. The proposed 19ha project site is indicated in purple.

The PV panels are designed to operate continuously for 25 – 30 years, unattended and with low maintenance.

During the planning phase of the project numerous layouts and technologies were taken into consideration before the preferred proposal was decided upon. Three of the major points which lead to the preferred proposal are:

- Minimal disturbance to water washes and highly sensitive areas
- 20 Hectare area limit
- Minimum distance to the substation

The factor having the single biggest influence on point number one is the mounting technology. The preferred technology allows arrays to be constructed over the wash lines while having a minimal effect on the vegetation mitigating the chances of erosion. The facility will be designed such that the wash itself will be spanned as far as possible.

Two alternative locations were initially considered for this report: *Scattered layout Alternative and the Preferred Layout Alternative referred to in the Basic Assessment Report*, however upon further studies it was decided that the scattered layout would not be feasible, therefore it was not considered further. For the Preferred Layout, the solar arrays will be placed in such a way that it would have the least influence on the washes while keeping clear of the servitudes around the 33/132kV Eskom lines as well as avoiding the ecological boundaries set where practically possible.

The Preferred Layout Alternative has taken a road diversion into account which allows the solar arrays to form a more concentrated area in order to keep the overall footprint as small as possible. If the access road is allowed to pass between the solar arrays, a substantial buffer would have to be established in order to keep the road safe, and the risk for electrocution to travellers as low as possible. Therefore it was concluded that the road will be diverted in order to minimise these impacts.

In terms of the Environmental Impact Assessment (EIA) Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), **Scuitdrift Solar Project (Pty) Ltd.** required authorisation for the construction of the 5MW solar PV facility, on-site substation and other associated infrastructure. In terms of Sections 24 and 24D of the National Environmental Management Act (No 107 of 1998), as read with the EIA Regulations of GN R982 – R985, a Basic Assessment process was undertaken in support of the application for authorisation for the proposed project.

The EMPr has been developed and revised on the basis of the findings of the Basic Assessment Report and the requirements included in the Environmental Authorisation, and must be implemented to protect sensitive on-site and off-site features through controlling preconstruction, construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This revised EMPr is applicable to all **Scuitdrift Solar Project (Pty) Ltd** employees and contractors working on the pre-construction, construction, and operation and maintenance of the 5MW solar PV facility as well as buildings and substation. The document will be adhered to and updated as relevant throughout the project life cycle.

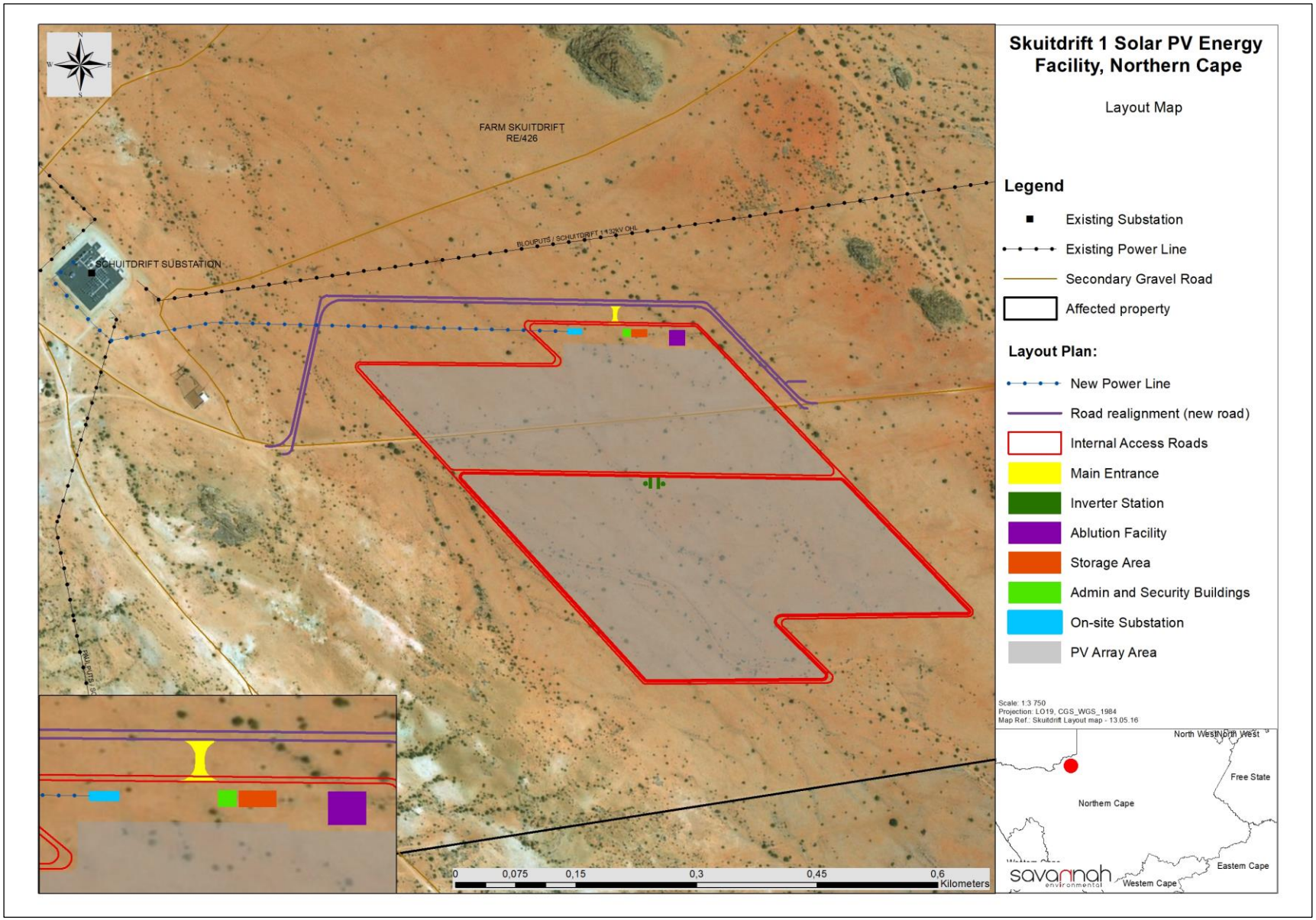

Figure 2: Facility layout for the Skuitdrift 1 Solar PV Energy Facility

2.2 Findings of the Basic Assessment Report

This section provides a summary of the environmental assessment and conclusions drawn for the proposed Skuitdrift 1 Solar PV Energy Facility which will connect to the existing on-site Eskom Schuitdrift substation via a new 33kV power line. In doing so, it draws on the information gathered as part of the Basic Assessment process and the knowledge gained by the environmental consultants during the course of the process, and presents an informed opinion of the environmental impacts associated with the proposed project.

Based on the information contained in the Impact Assessment, it is evident that there are no High Negative Impacts post mitigation which should prohibit the project from proceeding or should warrant further specialist investigation. Furthermore, all impacts associated with the preferred development footprint can be easily mitigated to acceptable standards.

Ecology: Overall, the site is not viewed as being highly ecologically sensitive, and with standard mitigation measures in place, the risk of significant environmental impact or degradation as a result of the development is very low. The final layout as proposed by the developer takes sufficient cognizance of the site sensitivities and the non-invasive construction approach proposed by the developer is viewed as a positive contributing factor to mitigating potential impacts at the site. As a result, **the project is considered acceptable from an ecological perspective.**

Hydrology: The proposed solar project and the associated infrastructure will occupy a total footprint area of 19 ha which amounts to 0.01% of the total quaternary catchment area. Any disturbance or alteration of runoff (if any) from this area will be very small and is considered negligible. The appropriate mitigation/management measures to prevent and/or minimise the identified potential surface water impacts, should they occur, have been provided. With the proposed mitigation and management measures in place, this project is unlikely to pose a significant threat to the natural water course and the hydrological features within and around the project area. The proposed development of the Skuitdrift 1 Solar PV Energy Facility is **considered to be acceptable from a hydrological perspective.**

Avifauna: Recent bird atlas data reveals only 39 avian species recorded in or around the development footprint, of which 2 were collision-prone (African Fish-Eagle *Haliaetus vocifer,* and the *Vulnerable* Verreaux's Eagle *Aquila verreauxii*). However, older bird atlas data indicates two other red-data species are also likely on site: the collision-prone Ludwig's Bustard *Neotis ludwigii* and Sclater's Lark *Spizocorys sclateri*.

Due to the size of the development footprint, the site is likely to be of a low risk to the birds present. If appropriate mitigation measures are followed to minimise any impacts to threatened species then the preferred development footprint is **considered acceptable from an avifaunal perspective**.

Heritage, Archaeology and Palaeontology: No archival references referring to historic themes, which include the possibility of grave sites/ burial ground on the proposed development site and/ or lands directly contiguous to it could be located. There was, however, a single grave (not older than 60 years) and at least two empty graves noted just off a narrow track, directly north of the proposed development site, however these are situated outside the proposed development footprint and would not be affected through the proposed development, therefore the impact of development on these sites are expected to be low in significance.

In terms of palaeontology, the overall impact significance of the proposed development on fossil heritage is considered to be very low since most of the study area is underlain by unfossiliferous metamorphic basement rocks (granite-gneisses etc.) or mantled by superficial sediments of low palaeontological sensitivity, and no extensive, deep excavations are unlikely to be undertaken during the project. Lastly, no significant archaeological occurrences were found on the site, however dense scattered quartz pieces were found outside the development site around the nearby ridgeline / koppie which will be demarcated as a no-go area and avoided by the solar installation.

If mitigation measures are implemented, the proposed development footprint **is considered acceptable from a heritage perspective**.

Agricultural Potential: Overall, the proposed development footprint does not have any agricultural value and has not for many years been utilised for any extensive agricultural purposes. The site is too small to generate noteworthy financial benefit from agricultural activities. Furthermore, the combination of poor soil quality, water scarcity and distance from the market hinders the possibility of the commercial production of grain, vegetables and horticultural products. Moreover, irrigation on this dry and arid area is excluded due to low availability of water.

The low agricultural potential of the site can be ascribed to a combination of the geology, climate and vegetation. Therefore, the development site is not economically productive, mainly due to the extreme nature of the climate and the low potential of the soil. As a result, **the project is considered acceptable from an agricultural perspective.**

Visual Impacts: The visual impact of the Skuitdrift 1 Solar PV Energy Facility as assessed in the Basic Assessment Report will not result in the degradation of the character of the existing landscape. Furthermore, the isolated nature of the development is not a visual intrusion for the day-to-day life of the landowner and his family. Therefore, the potential visual impacts associated with the proposed development are expected to have a **low significance and should not alter/influence the outcome of the project decision-making.**

Social Impact: Social impacts are expected during all phases of the development and are expected to be both positive and negative. Impacts are expected to be of medium- low significance for the various issues. Impacts can be minimised or enhanced through the implementation of the recommended management measures. **From a social perspective, the construction of the proposed Skuitdrift 1 Solar PV Energy Facility is considered acceptable.**

Overall conclusion

From the specialist studies undertaken, the preferred development footprint for the Skuitdrift 1 Solar PV Energy Facility is considered to be acceptable from an environmental perspective. The proposed power line corridor and substation location is also considered technically and financially feasible.

Based on the findings of the studies undertaken, in terms of environmental constraints and opportunities identified through the Environmental Basic Assessment process, no environmental fatal flaws were identified to be associated with the construction of the proposed solar PV facility, power line and substation (refer to **Figure 3**).

Impacts are expected to be **medium - low** or **very low** after the implementation of the mitigation and monitoring measures which would allow for the minimisation and management of potential environmental impacts associated with the proposed development. These have been incorporated into the EMPr for the project which will be further developed during the detailed planning and design phase of the project. It is therefore recommended that the proposed development can be implemented. With reference to the information available at this planning approval stage in the project cycle, the confidence in the environmental assessment undertaken is regarded as acceptable.

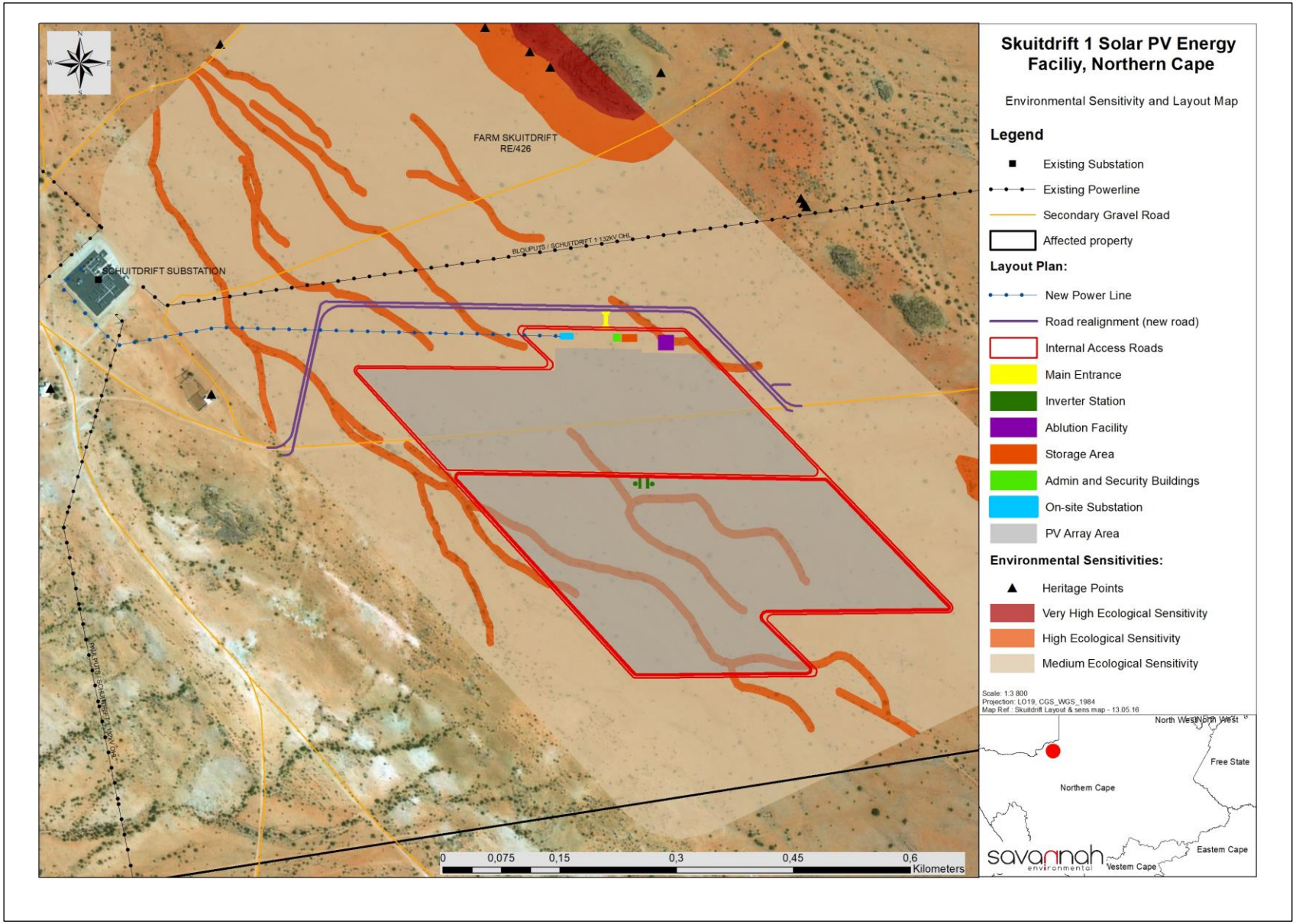

Figure 3: Map indicating the environmental sensitivities present at the 19ha site. The "washes" are indicated in Orange (**Appendix A**)

2.3 Activities and Components associated with the proposed development of the Skuitdrift 1 Solar PV Energy Facility and all associated infrastructure:

The main activities/components associated with the proposed Skuitdrift 1 Solar PV Energy Facility are detailed in the sections below.

2.3.1. Pre-Construction Phase

Prior to initiating construction, a number of detailed surveys will be required including, but not limited to:

- *Geotechnical survey:* a geotechnical survey has been completed as part of a detailed Engineering, Ecology and Agricultural report (refer to **Appendix J1, D1 and J6 of the BAR**) which details the landscape features, geology and topography of the development footprint. The geotechnical study considered flood potential, foundation conditions, and the potential for excavations. This study informs the Engineering, Procurement, and Construction (EPC) Contractors regarding soil conditions, required to specify foundations required for the support structures, and the extent of earthworks and compaction required in the establishment of any internal access roads.
- *Ecological Walk-Through* – A full ecological walk-though of the site is to be conducted prior to commencement of construction. In compliance with the Department of Agriculture, Forestry and Fisheries (DAFF), The South African Heritage Resource Agency (SAHRA) and the Department of Environmental Affairs (DEA), the walk-through will critically analyse the project site and identify any other potential impacts on the available landscape.
- *Site survey:* this will be required to finalise the design layout of the PV solar field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the facility.
- *Environmental Permits:* Obtain any additional environmental permits required (e.g. water use license, and protected plant permits, etc.) before the commencement of construction. Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA and must be made available on request.
- *Construction materials and equipment requirements:* 30-40% of construction material and equipment may be sourced locally (i.e. within South Africa), depending on technical capabilities and prices of local industry. The materials and equipment will be transported to site by road.
- *Power line survey: O*nce the placement of the power line towers have been finalised, a walk through survey will be undertaken for archaeology and heritage resources which may necessitate certain towers to be moved to avoid sensitivities.
- *Water requirements:* The water required for the project is approximately ~1500kL for the construction phase over 6 months and approximately 3kl of water per day should be required for the cleaning of solar panels and for other requirements during the proposed operational phase of the project.
- *Staff requirement*: On average, an estimated labour force will comprise of skilled (10%), semi-skilled (10%) and low skilled (80%) staff. The construction phase will generate job opportunities for roughly 10 - 75 people, whilst 3 – 10 people will be employed during the operation phase. Staff are expected to be sourced from Pofadder and Kakamas, and neighbouring communities such as Augrabies (i.e. as these skills are unlikely to be available within the local community). The specialists / foreigners forming part of the construction team are likely to make use of the local establishments for accommodation facilities. It is expected that most of the construction (i.e. civil works) will be done by local South African companies. The use of local contractors such as Small, Medium, and Micro Enterprises (SMMEs) operating in the area will be considered by the EPC partner, and will be driven largely by what skills and

services could be sourced from local SMMEs (i.e. as part of a competitive tendering process). The EPC partner will determine the standards which all workers need to comply to and this will be in line with South African standards and laws applicable to the construction industry.

» *Length of the construction phase:* Commencement of the construction phase is dependent on a generating license being issued by NERSA, and a Power Purchase Agreement being secured with Eskom/ Treasury or the designated buyer of renewable energy electricity and successfully reaching financial close. Construction is estimated to extend over a period of 6 months.

2.3.2. Construction Phase

The construction phase has an anticipated timeframe of 6 months. A facility consisting of several PV arrays with a contracted capacity of 5MW will take up to 6 months to construct and commission, and would require the expertise of skilled (10%), semi-skilled (10%) and low skilled (80%) staff. Solar PV technology is expected to employ roughly 10 - 75 people for the total construction period. In order to construct the proposed facility and its associated infrastructure, a series of activities will need to be undertaken which is:

Step 1: Site survey, survey of substation site, power line and road servitudes. This will entail:

» Search Rescue and relocation of species of special concern
» Site preparation activities will include:
  * Clearance of vegetation at the footprint of the area infrastructure (i.e. solar field and associated infrastructure);
  * Levelling of site (as necessary);
  * Clearance of vegetation at the footprint of the linear component (i.e. internal access roads);
  * The development of stormwater control management systems which may include drainage channels which will collect all rain water and lead it to the natural stormwater drainage system; and
  * These activities will require the stripping of topsoil which will need to be backfilled as construction progresses and stockpiled for future rehabilitation.

Step 2: Establishment of external and internal access roads: The project site proposed for the development is accessible from the N14 from two divisional roads, the R359 and DR3256 which fall under the ZF Mgcawu District Municipality. Within the site itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). Internal access roads of up to 4m in width will be required.

Step 3: Establishment of construction equipment camps, storage facilities and laydown areas:

» Once the required equipment has been transported to site, dedicated construction camp(s), storage facilities, and laydown area/s will need to be established. These areas serve to confine activities to a designated area to limit potential site disturbance. The laydown area will be used as a logistical area for the contractors and as a prefabrication area.
» The fuel required for on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction camp to prevent leakages and soil contamination.

Step 4: Establishment of substation and power line:

» A new ~ 630m 33kV power line between the on-site substation and the Eskom grid connection point.
» Cabling between the projects components, to be laid underground where practical.

- A power line is constructed by surveying the power line route, construction of foundations for the towers, installation of the towers, stringing of conductors and finally the rehabilitation of disturbed areas and protection of erosion sensitive areas.
- The position of the inverters within the footprint will be informed by the final positioning of the PV components.
- The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Step 5: Assembly and erection of PV panels:

- The PV panels will be arranged in arrays, the mounting structure will be preferably fixed onto the ground with the use of rammed or screw anchor foundations.
- Trenching would occur within each array to accommodate the electrical cables. The trenches would be up to ~ 1.8m in width and 2m deep and will run the length of the PV panels. Minimal ground disturbance may occur within the trenched corridors to restore them after soil has been replaced in the trenches, so that the corridor can conform to the existing surface contours.

Step 6: Extraction of water from the existing borehole situated near the site.

Step 7: Undertake site rehabilitation and establishment of the stormwater management plan:

- Areas requiring rehabilitation will include those areas disturbed during the construction phase and are not required for operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.
- Where relevant, disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.
- All temporary facilities, temporary equipment, and waste materials must be removed from site.
- Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and washes), to minimise loss of topsoil and control erosion.
- Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.

Areas requiring rehabilitation will include those natural areas disturbed during the construction phase and those that are not required for operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area. Where relevant, disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. All temporary facilities, equipment, and waste materials will be removed from site. Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and washes), to minimise loss of topsoil and control erosion. Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.

2.3.3. Operation and Maintenance Phase

The Skuitdrift 1 Solar PV Energy Facility is expected to employ roughly 3 – 10 people for the operation phase. The following activities to be undertaken during the operation phase:

Step 1: Sourcing, treatment and use of water:

- Approximately 1.5kl of water per day (total ~500kL per year) should be required for the cleaning of solar panels and for other requirements during the proposed operational phase. The water is to be sourced from a borehole within the property.

Step 2: Treatment and disposal of waste water:

- Any water from ablution facilities will be collected in a septic tank. This tank will be emptied as required and sewage disposed of at the nearest municipal sewage waste facility.

Step 3: Operation of the PV panels and the associated electrical infrastructure:

- The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current).
- The inverters will convert the power from direct to alternating current.
- A new 33kV power line ~630m long between the on-site substation and the Eskom grid connection point.
- Occasional cleaning of the panels will be required throughout the life cycle of the facility when necessary.

Step 4: Site operation and maintenance:

- Full-time security, maintenance, and control room staff will be required on site.
- Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.
- The access to the site and the internal access roads will be maintained during the operational phase.
- Vegetation maintenance and weed control measures will be undertaken as required.

The PV panels are designed to operate continuously, unattended and with low maintenance for approximately 25 - 30 years. The electricity that is generated from the PV panels will be converted from direct current (DC) to alternating current (AC) by inverters, and stepped up by the medium voltage transformers at each generating unit and the medium-high transformer at the on-site substation. Thereafter the power will be evacuated from the onsite Eskom substation and supplemented into the national Eskom electricity grid. The solar facility will be operational during daylight hours, except during maintenance, poor weather conditions, breakdowns or interruption of the connection to the Eskom grid. Regular maintenance will typically include periodic cleaning, greasing of bearings and inspection. The solar panels will preferably be cleaned with water or alternatively with compressed air.

An estimated total of six (6) full-time staff members will typically be required during the operation phase of the project, which includes technicians, maintenance and security personnel. Approximately three (3) unskilled labourers will be needed for maintenance purposes and two (2) security personnel will be deployed on a shift basis. One (1) skilled staff member will be needed to manage and oversee the operations. From time to time additional contract staff (+/- 10) may be required for ad hoc ground cleaning or special panel cleaning. However, a total of between 3 - 10 people will be permanently employed during operation. Staff can be transported around the site using utility vehicles and a typical mini bus to transport staff from nearby towns of Pofadder and Kakamas as well as from the surrounding community of Augrabies.

Summary of the operation and maintenance activities are expected to form part of the project scope of works:

» Operation of the PV panels and associated infrastructure;
» Cleaning of the PV panels; and
» Site operation and maintenance.

2.3.4. Decommissioning Phase

The PV facility is expected to have a lifespan of approximately 25 - 30 years. If economically feasible/desirable the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/ infrastructure available at that time. However, if not deemed so, then the facility would be completely decommissioned which would include the following decommissioning activities:

» **Site Preparation:** Site preparation activities similar to those undertaken in the construction phase will be required during the decommissioning phase. This will include confirming the integrity of site access to the site in order to accommodate the required equipment (e.g. laydown areas and decommissioning camp) and the mobilisation of decommissioning equipment.
» **Disassemble and remove existing components:** The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.
» **Rehabilitation of the Site:** disturbed areas due to the decommissioning activities must be rehabilitated to appropriate levels.

CHAPTER 3: KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT

The following legislation and guidelines have informed the scope and content of this EMPr:

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under Chapter 5 of the NEMA (GNR 984, GNR 985 in Government Gazette 38282 of 4 December 2014).
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  - Public Participation in the EIA Process (DEA, 2010).
  - Integrated Environmental Management Information Series (published by DEA).
- International guidelines – the Equator Principles.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the Basic Assessment Report. A list of all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations is included in **Table 3.1**.

Table 3.1: Applicable Legislation, Policies and/or Guidelines

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	National Legislation		
National Environmental Management Act (Act No. 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 983 and 985 of June 2010 a Basic Assessment Process is required to be undertaken for the proposed project.	» National Department of Environmental Affairs (DEA) » Northern Cape Department of Environment and Nature Conservation (NC DENC) – commenting authority	The listed activities triggered by the proposed Project have been identified and assessed in the EIA process (i.e. Basic Assessment). The Basic Assessment process was completed in November 2016 and Environmental Authorisation was granted by the DEA on 23 March 2017.
National Environmental Management Act (Act No. 107 of 1998)	In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised.	DEA	While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed project has found application in the EIA process. The implementation of mitigation measures are included as part of the EMPr and will continue to apply throughout the life cycle of the Project.
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007.	» DEA » NC DENC	From a general ecological perspective, the site is not viewed as being highly sensitive. No endangered plant species were observed to occur within the proposed development area and there are no listed faunal species with a narrow distribution which occur at the site.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA Phase. » The Act provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (GG 34809, GN 1002), 9 December 2011).		*Hoodia Gordonii* is located within the general area but not in the Skuitdrift 1 Solar PV Energy Facility footprint. This was identified in the Ecological Walk-through report (**Appendix K**) under the Threatened or Protected Species (TOPS) regulations. Therefore no licence is required.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities (Category A and B) while Category C Activities (such as storage of waste) must be undertaken in accordance with the necessary norms and standards.	» DEA » NC DENC	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPr (refer to Appendix G).

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	S18, S19, and S20 of the Act allow certain areas to be declared and managed as "priority areas." Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards. » GN R 827 – National Dust Control Regulations prescribes general measures for the control of dust in all areas	» DEA » Kai!-Garib Local Municipality	Dust Control Regulations describe the measures for control and monitoring of dust, including penalties. These regulations might be applicable during the construction phase of the project. Dust management have also been accounted for in this EMPr.
National Water Act (Act No. 36 of 1998)	Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation. In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	» National Department of Water and Sanitation » Northern Cape Department of Water and Sanitation	A water use license (WUL) or General Authorisation might be required in terms of Section 21 of the Act. Should the road alteration / upgrade cross any dry watercourses/washes/ washes, the Water Use Licence Application (WULA) should be supplemented to apply in terms of Section 21(c)&(i).
Environment Conservation Act (Act No. 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» DEA » NC DENC	Noise impacts are expected to be associated with the construction phase of the Project, but are not likely to present a significant intrusion to

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			the local community. There is no requirement for a noise permit in terms of the legislation.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	» A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. » Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act. » S18, S19, and S20 of the Act allow certain areas to be declared and managed as "priority areas." » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards. » GN R 827 – National Dust Control Regulations prescribes general measures for the control of dust in all areas	» Department of Mineral Resources	As no borrow pits are expected to be required for the project, no mining permit or right is required to be obtained.
National Heritage Resources Act (Act No. 25 of 1999)	» S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent » The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. » Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.	» South African Heritage Resources Agency (SAHRA) » Northern Cape Heritage Resources Authority	A permit may be required should any identified cultural/ heritage sites be disturbed or destroyed as a result of the development. No sites were identified in the Heritage Walk-through report (**Appendix L**). The Heritage, Archaeological and palaeontological studies (refer to **Appendix J3, J4 and J5 of the Basic Assessment Report**) confirmed that: » No buildings older than 60 years and heritage significance were identified within the solar development site. » Grave sites are located directly north of the solar development site. The impact of development on these sites is thus expected to be of a Low significance as recommended by SAHRA.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	» In terms of Section 34(1), no person may alter or demolish any structure or part of a structure, which is older than 60 years		» No archaeological occurrences identified to occur with the solar development site (occurrences found outside the site are to be avoided by all activities). » Furthermore, the sensitive areas near the koppies, although outside of the development area, should be avoided during construction activities. The **Environmental Officer** (EO) should be made aware of the presence of archaeological resources there so that their safeguarding during construction can be ensured.
National Forests Act (Act No. 84 of 1998)	» In terms of S5(1) 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 license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » The list of protected tree species was published in GN 877 of 22 November 2013.	» Department of Agriculture, Forestry and Fisheries » NC DENC	The Ecology Walk-Through report (**Appendix K**) identified Acacia erioloba trees on site, all of which are located within washes. All the *Acacia erioloba* trees encountered (six) are relatively small, three (3) metres or less in height with a narrow crown. Encountered trees were otherwise healthy.
National Veld and Forest Fire Act (Act 101 of 1998)	» In terms of S12 the landowner would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of S12 the firebreak would need to be wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. » In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Agriculture, Forestry and Fisheries	This Act will find application during the construction and operational phase of the project. The roles and responsibilities of landowner in terms of ensuring compliance must also be identified and assessed throughout the duration of the project life cycle.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Conservation of Agricultural Resources Act (CARA) (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5). » Classification of categories of weeds and invader plants (Regulation 15 of GN R1048) and restrictions in terms of where these species may occur. » Requirement and methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048). » The Conservation of Agricultural Resources Act defines different categories of alien plants: » **Category 1** - prohibited and must be controlled; » **Category 2** – must be grown within a demarcated area under permit; and » **Category 3** - 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 floodlines of water courses and wetlands	Department of Agriculture, Forestry and Fisheries	The Skuitdrift 1 Solar PV Energy Facility development site is relatively free of alien plant species. Alien plants are however likely to become an issue if the site is highly disturbed during construction or if water runoff is not properly managed. Mitigation measures have been recommended to avoid the risk of increased alien invasion during construction and operation phases of the solar facility (refer to Objective 14 of Chapter 7).
Hazardous Substances Act (Act No. 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.	» Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license could be required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Road Traffic Act (Act No 93 of 1996)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts. » The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	» Provincial Department of Transport (provincial roads) » South African National Roads Agency Limited (national roads)	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits could be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Depending on the trailer configuration and height when loaded, some of the components may not meet specified dimensional limitations (height and width) and would need to apply for the relevant permit/ clearance.
Provincial Legislation			
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	» Provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require. **Manipulation of boundary fences** 19. No Person may – (a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;	» NC DENC	A permit is required for any activities which involve species listed under schedule 1 or 2. The NC DENC permit office provides an integrated permit which can be used for all provincial and Threatened or Protected Species (TOPS)-related permit requirements. *Boscia foetida* was found on site and is listed on Schedule 2 (Protected Species). There are twenty-nine (29) *Boscia foetida* on site. The individuals found were healthy. The species was identified in the Ecology Walk-Through report (**Appendix K**).

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	The Act also lists protected fauna and flora under 3 schedules ranging from Specially protected (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1.		

CHAPTER 4: PURPOSE AND OBJECTIVES OF THE EMPR

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced". The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This Construction and Operational Environmental Management Programme (CEMPr and OEMPr) has been compiled for the Skuitdrift 1 Solar PV Energy Facility. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to and updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations of December 2014. This document is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project (if required) and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

- Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the power line and on-site substation.
- Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
- Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The management and mitigation measures identified within the Basic Assessment (BA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Scuitdrift Solar Project (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits issued for the proposed project, as well as to obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMP and through its integration into contract documentation for the construction and operation of the proposed PV facility. Since this EMP is part of the Basic Assessment process it is important that this document be read in conjunction with the Basic Assessment Report as well as with the Environmental Authorisation. This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

To achieve effective environmental management, it is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

- Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility and associated infrastructure.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Providing basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on/off the site.
- Ensuring awareness of any other environmental matters, which are deemed necessary by the ECO.

This EMPr shall be binding on all the parties involved in the planning, construction and operation of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to and updated as relevant throughout the project life cycle.

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CHAPTER 5: STRUCTURE OF THIS EMPR

The EMPr must be seen as a dynamic document and must be included in all contract documentation for all phases of the development. The EMPr must be strictly enforced during all phases of the project.

The preceding chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

» Planning and design activities;
» Construction activities;
» Operation activities; and
» Decommissioning activities.

These chapters set out the procedures necessary for the project, as the project owner, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation for the solar energy facility project, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the BA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management programme.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- Planned activities change (i.e. in terms of the components and/or layout of the facility);
- Modification to or addition to environmental objectives and targets;
- Relevant legal or other requirements are changed or introduced; and
- Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

Table 3: Management plans for the Skuitdrift 1 Solar PV Energy Facility

Plans required	Location in report
Grievance Mechanism for Public Complaints and Issues	Appendix B
Erosion Management Plan	Appendix C
Waste Management Plan	Appendix D
Stormwater Management Plan	Appendix E
Emergency Management Plan	Appendix F
Traffic Management Plan	Appendix G
Plant Rescue and Protection Plan	Appendix H
Revegetation and Rehabilitation Plan	Appendix I
Alien Invasive Management Plan	Appendix J

5.1. Objectives

	Name	Company
EMP Compilers:	Lisa Opperman Jo-Anne Thomas	Savannah Environmental
Specialists:	Rob Simmons - Avifaunal	Bats and Birds Limited
	Simon Todd - ecology	Simon Todd consulting
	Afzelia- Visual	Jonathan Marshall
	Digby Wells Environmental	Mashudu Rafundisani
	Savannah Environmental	Pamela Sidambe
	Techso	Traffic

The Savannah Environmental team have extensive knowledge and experience in EIAs and environmental management, having been involved in EIA processes over the past 12 years. They have managed and drafted EMPrs for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

CHAPTER 6: PLANNING AND DESIGN MANAGEMENT PROGRAMME

Overall Goal: undertake the pre-construction activities (planning and design phase) in a way that:

- Ensures that the preferred design and layout of the PV panels, on-site substation and associated infrastructure responds to the identified environmental constraints and opportunities.
- Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements
- Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- Ensures that the best environmental options are selected for the linear components (underground cable network, short distribution powerline), including the access roads.
- Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

6.1. Objectives

OBJECTIVE 1: Ensure the facility design responds to identified environmental constraints and opportunities

No definite *'no go'* areas, except the koppies mentioned in point 2 below, were identified by the specialists during the EIA Phase within the development site. However, a number of potentially sensitive areas were identified to be associated with the project area, which included:

- *Areas of ecological sensitivity* – Overall the site is not viewed as being highly sensitive. There are however sensitive 'washes' occurring at the site which will be avoided as far as possible by the PV panel installations through the spanning of the panels over these sensitive features. Permits will be obtained for the removal of the *Acacia erioloba* trees and *Boscia foetida* (Sheppard's bush). Factors which contribute to the low risk associated with the development of the site include the low slope, coarse sandy soils and homogenous nature of the plain which forms the site. In addition, the site is in close proximity to the existing Eskom Schuitdrift substation and transmission infrastructure.
- *Areas of heritage sensitivity* – Although the 'Koppies' of High Sensitivity fall outside the proposed ~19ha development footprint, the area still needs to be demarcated and identified throughout the project lifecycle as a No-Go area. It must be noted that if in the case of cultural or historical sites being exposed or disturbed and resources uncovered, this must be reported immediately to SAHRA.

Project Component/s	» PV Panels » Access roads » Short overhead distribution power line » On-site substation » Inverter stations » Transformer

	» Underground cabling » Associated buildings (i.e. workshop, ablution facilities, control room; storage).
Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all the facilities components » Construction of the underground cabling » Connection to the on-site substation » Access road re-alignment
Mitigation: Target/Objective	» The design of the power line and on-site substation responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer/Owner Contractor	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Developer/Owner Geotechnical specialist	Pre-construction
Conduct a final walk-down by a professional archaeologist before construction may commence.	Developer/Owner Specialist	Pre-construction
Apply for a Water Use License or a general authorisation in terms of the National Water Act (Act 36 of 1998).	Developer/Owner	Pre-construction
Obtain any additional environmental permits required (e.g. water use license, and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Developer/Owner	Project planning
No construction activities must commence without having obtained the necessary permits for threatened or protected species (ToPS) listed and provincially protected species within the study area.	Developer/Owner	Project planning
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and relevant appendices.	Engineering design consultant, solar component supplier, and Developer	Design review
A designated access to the site must be created and clearly marked to ensure safe entry and exit.	Developer/Owner Contractor	Design
Internal access road to be carefully planned to maximise road user safety and limit any intrusion on the neighbouring property owners and road users.	Developer/Owner Contractor	Design
Roads must be designed so that changes to surface water runoff are avoided and erosion is not initiated.	Developer/Owner Contractor	Design
The road network to access the panel arrays should be established first and then all vehicular movement must be restricted to within this road network. This will minimise the impact of construction traffic on the undeveloped portion of the property	Developer/Owner Contractor	Design and Planning
Construction vehicles carrying materials to the site must avoid using roads through densely populated built-up areas so as to not disturb existing retail and commercial operations.	Developer/Owner Contractor	Design and Planning

Mitigation: Action/Control	Responsibility	Timeframe
An appropriately designed and effective stormwater management system must be developed and implemented.	Developer/Owner Contractor	Design and Planning
Kerbs and stormwater channels must be designed in such a way that it allows small animals and reptiles to move freely.	Developer/Owner Contractor	Design and Planning
Contractors and construction workers must be clearly informed of the no-go areas.	Developer/Owner , Contractor and ECO	Prior to the commencement of construction
Demarcation of no-go areas which must reflect the exact footprint of the construction area, including panel foundations and all roads (including haul roads which must make use of the final road layout) and infrastructure which are to be surveyed and pegged before any physical construction commences on site.	Developer/Owner , Contractor and ECO	Prior to the commencement of construction
Compile a comprehensive storm water management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of storm water within the site (i.e. separate clean and dirty water streams, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the mirrors), as well as appropriate drainage around the site.	Developer/Owner Contractor	Design
Plan and placement of light fixtures for the plant and the ancillary infrastructure in such a manner as to minimise glare and impacts on the surrounding area.	Developer/Owner Contractor	Planning.
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer/Owner Contractor	Pre-construction
Plan the placement of laydown areas and construction equipment camps in order to minimise vegetation clearing and impacts on identified sensitive areas.	Developer/Owner	Pre-construction
No temporary site camps will be allowed outside the footprint of the development area as the establishment of such structures may trigger a listed activity as defined in the EIA Regulations, 2014.	Developer/Owner	Design and planning
Should any amendment be made to the Layout, the revised layout plan for the entire PV facility must be submitted to the DEA for approval prior to commencement of construction.	Developer/Owner	Pre-construction
Fourteen (14) days written notice must be given to the Department that the activity will commence, this includes site preparation. The notification must include a date on which the activity will commence as well as the reference number.	Developer/Owner	Pre-construction
An experienced independent Environmental Control Officer (ECO) must be appointed for the construction phase. The EO will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations included in the Environmental Authorisation are implemented to ensure compliance.	Developer/Owner	Pre-construction
The ECO must be appointed before the commencement of the authorised activities. Once appointed, the name and contact details of the ECO must be submitted to the Director: compliance and Monitoring of the DEA. The ECO must remain employed until all rehabilitation measures, as required for implementation due to	Developer/Owner	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
construction damage, are completed and the site is ready for operation.		
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Developer/Owner Contractor	Pre-construction
The procurement and design strategy of the project is required to implement technically feasible and cost-effective measures of reducing resource consumption and greenhouse gases, the measures of which should be communicated to all relevant staff members.	Developer/Owner Contractor	Planning and Design phase Duration of project life cycle
All areas to be cleared should be clearly demarcated. Sensitive areas as demarcated on the sensitivity map should be avoided, and where such areas occur within or near the development area, they should be clearly demarcated as no-go areas. Only those individuals of protected plant species directly within the development footprint should be cleared. Sensitive areas with appropriate buffers at the site such as the washes should be demarcated at the site by an ecologist as part of the preconstruction activities for the site.	Developer/Owner ECO	Design review phase
Areas outside of the footprint, including sensitive areas and buffer areas, must be clearly demarcated (using fencing and appropriate signage) before construction commences and must be regarded as no-go areas.	Developer/Owner Contractor	Pre-construction
Underground cables and internal access roads must be aligned as much as possible along existing infrastructure to limit damage to vegetation and watercourses.	Developer/Owner Contractor	Design Pre-construction
Lighting for both the construction phase and through the operation of the facility must be of low-pressure sodium type, preferably yellow. All perimeter and security lighting must be attached to motion detectors, and should be dark-sky friendly.	Developer/Owner Contractor	Planning and Design phase Duration of project life cycle
Obtain permits for protected plant removal and relocation prior to commencement of any activity related to this development: As a minimum, permits will be required to remove all or some of the *Acacia erioloba*. Four (4) individuals of *Acacia erioloba* were within the proposed development area and an additional two in close proximity to the development. A permit is also required for the removal of *Boscia foetida*. Twenty-nine (29) individuals of *Boscia foetida* present within the development area will need to be removed.	Developer	Pre-construction
A walk-through by a qualified avian specialist is required before clearing of vegetation. The walk-through report must guide the clearing process and must be kept by the ECO. The walk-through report must also identify the risks imposed by the overhead powerline. The report must be made available on request.	Contractor with a avifaunal specialist	Pre-construction planning and design and

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Demarcated sensitive areas are be avoided at all times

	» Design and layouts respond to the mitigation measures and recommendations in the Basic Assessment Report.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE 2: Ensure the selection of the best environmental option for the alignment of the overhead power line, underground cabling and re-aligned access road

Underground cables will be laid between the PV panels, the transformers and the switchgear. This will require the excavation of trenches within which they can then be laid. A new 33kV overhead power line linking the proposed on-site substation/operation building to the existing Eskom Schuitdrift Substation. The existing access road to the homestead and Eskom substation will be diverted to the immediate north and around the solar facility, outside the parameter security fence. This is done in order to avoid fragmenting the PV arrays. The existing access roads do not need to be upgraded as they are in good condition. The site is directly accessible off the R359 and DR3256 roads, via farm access roads.

Project Component/s	» Underground cabling. » Temporary internal access roads.
Potential Impact	» Routes that degrade the environment unnecessarily, particularly with respect to loss of indigenous flora, and erosion.
Activities/Risk Sources	» Alignment of underground cabling. » Alignment of power line. » Alignment of new temporary access roads.
Mitigation: Target/Objective	» Ensure selection of best environmental option for alignment for the linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Select an alignment for the underground cabling, overhead power line and any new temporary access roads that curtails environmental impacts and enhances environmental benefits.	The developer and Contractor	Prior to submission of the final construction layout plan
Consider design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and relevant appendices.	Contractor	Design

Performance Indicator	» Underground cabling, overhead power line and new access road alignments meet environmental objectives. » Selected linear alignments that minimise any negative environmental impacts and maximise any benefits.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the Basic Assessment Report through review of the design by the Project Manager, and the ECO prior to the commencement of construction.

OBJECTIVE 3: Minimise stormwater runoff and subsequent alteration of the local hydrological regime

Project Component/s	» Stormwater management components. » All hard engineered surfaces (i.e. new access roads).
Potential Impact	» Poor stormwater management and alteration of the hydrological regime..
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of stormwater to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Appropriately plan hard-engineered erosion protection structures.	Developer/Owner Contractor	Planning and design
Design an appropriate storm water management plan for implementation during construction and operation. This plan must ensure the suitable handling of stormwater within the site (i.e. clean and dirty water streams around the PV facility.	The developer and Contractor	Planning and design
Construction must include appropriate design measures that allow surface and sub-surface movement of water along washes so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater runoff.	The developer and Contractor	Planning and design

Performance Indicator	» Appropriate storm water management plan developed for implementation prior to commencement of construction
Monitoring	» Surface water quality monitoring plan.

OBJECTIVE 4: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the development. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» PV Panels. » Access roads » Overhead distribution power line » Underground cabling. » Laydown area. » Associated buildings and associated infrastructure (workshop, storage facility, ablution facility, substation, inverters, transformers).
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with solar PV facility construction » Activities associated with solar PV facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners

	» Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (following the guidelines of the grievance mechanism in **Appendix B**) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer/Owner Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer/Owner Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaison with landowners is to be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Developer/Owner Contractor O&M Contractor	Pre-construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), should be informed of the details of the contractors, size of the workforce and construction schedules.	Developer/Owner Contractor	Pre-construction and construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» A Public Complaints register must be maintained, by the Contractor and monitored by the ECO, to record all complaints and queries relating to the project and the action taken to resolve the issue. » All correspondence should be in writing. » The developer and contractor must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes.

OBJECTIVE 5: Ensure that all relevant personnel and staff are familiar with the provisions of the EMPr, as well as the conditions of the Environmental Authorisation and environmental preservation

It is recommended that a pre-construction environmental compliance workshop be undertaken before any construction commences on site. This workshop can be combined with a site handover meeting, but must take place before any activities take place on site and before any plant is moved onto site. Furthermore, all construction workers should receive an induction presentation, as well as on-going environmental education, awareness and training on the importance and implications of the EMP and the environmental requirements it prescribes. The presentation must be conducted, as far as is possible, in the employees' language of choice. The contractor should provide a translator from their staff for the purpose of translating should this be necessary.

Project Component/s	» All components and activity impacts mentioned in the EMPr » All components and activity impacts mentioned in the Basic Assessment
Potential Impact	» Positive impact on creating project awareness » Skills improvement » Project compliance
Activities/Risk Sources	» Compliance workshop » Slide presentations » on-going environmental education and awareness training
Mitigation: Target/Objective	» Ensure » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Provision should be made in contract and tender documentation to attend a workshop.	» The Main Civil Contractor (including contract manager, site agent and foreman) » The Electrical Contractor (including contract manager, site agent and foreman) » The Consulting Engineers (electrical, civil and structural, whichever applicable) » Project Management.	Pre-construction
Induction training must ensure that construction workers/staff understand that no form of wildlife poaching, collecting or other form of disturbance will be permitted on the construction site or the adjacent areas.	EO	Pre-construction

Performance Indicator	» Staff Performance » Staff adherence » Staff attendance » Staff turn over » Ensure that the design implemented meets the objectives and mitigation measures in the Basic Assessment Report » The contractor must keep records of all environmental training sessions, including names, dates and the information presented. Details of the environmental induction are also to be included in the environmental control reports.
Monitoring **As a minimum, ongoing training should include:**	» Explanation of the importance of complying with the EMP; » Explanation of the importance of complying with the Environmental Authorisation; » Discussion of the potential environmental impacts of construction activities; » The benefits of improved personal performance; » Employees' roles and responsibilities, including emergency preparedness (this should be combined with this induction, but presented by the contractors Health and Safety Representative); » Explanation of the mitigation measures that must be implemented when carrying out their activities; and » Explanation of the specifics of this EMPr and its specification (no-go areas, etc.)

CHAPTER 7: MANAGEMENT PROGRAMME: CONSTRUCTION

Overall Goal: Undertake the construction phase in a way that:

- Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
- Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
- Minimises impacts on fauna (including birds) in the study area.
- Minimises the impact on heritage sites should they be uncovered.
- Establishes an environmental baseline during construction activities on the site, where possible.

7.1. Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, the Developer must ensure that the project complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. The Developer will retain various key roles and responsibilities during the construction phase.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMPr

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager; Site Manager; Internal Environmental Officer, Safety and Health Representative; Independent Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. **Figure 4** provides an organogram indicating the organisational structure for the implementation of the EMPr.

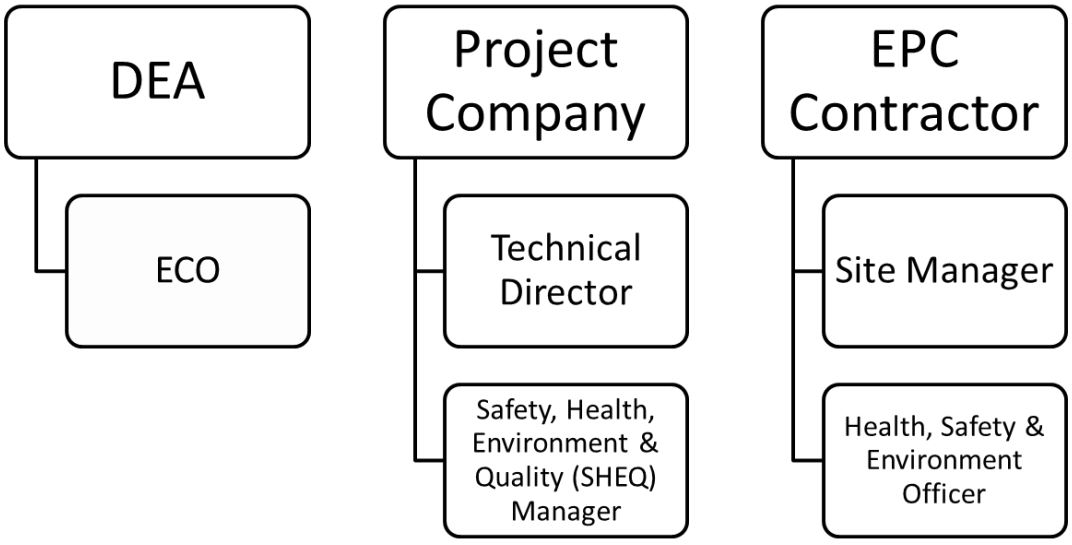


Figure 4: Organisational structure for the implementation of the EMPr

Construction Manager will:

- Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- Ensure that The Developer and its Contractor(s) are made aware of all stipulations within the EMPr.
- Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes through input from the independent ECO.
- Be fully conversant with the EIA for the project, the EMPr, the conditions of the Environmental Authorisation, and all relevant environmental legislation.
- Be fully knowledgeable with the contents of all relevant licences and permits.

Site Manager (The Contractors' on-site Representative) will:

- Be fully knowledgeable with the contents of the EIA and risk management.
- Be fully knowledgeable with the contents and conditions of the Environmental Authorisation.
- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- Have overall responsibility of the EMPr and its implementation.
- Conduct audits to ensure compliance to the EMPr.
- Ensure there is communication with the Technical Director, the ECO, the Internal Environmental Officer and relevant discipline engineers on matters concerning the environment.
- Be fully knowledgeable with the contents of all relevant licences and permits.
- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- Confine activities to the demarcated construction site.

An independent **Environmental Control Officer (ECO)** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- Be fully knowledgeable with the contents with the EIA.
- Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation.
- Be fully knowledgeable, maintain, update and review the EMPr.
- Be fully knowledgeable of all the licences and permits issued to the site.
- Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- Provide environmental induction training to contractors on site prior to commencing of construction activities
- Engineers Representative (with input from the ECO) has the authority to stop work on site if he / she consider that any actions of excessive non-compliance of the EMP, authorisations or General Duty of Care are taking place
- Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
- Compilation of the Environmental Audit Report or Environmental Completion Statement, six months after completion of construction or at a frequency in compliance with the Environmental Authorisation. Reports should be submitted to the relevant authority and the Project Proponent
- Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO. Reports should be submitted to the relevant authority on a monthly basis
- Ensure that the compilation of progress reports for submission to the Technical Director, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- Attendance of contractors site meetings
- ECO site inspections to be undertaken once a month to ensure compliance with the EMP. The duration of these visits may be increased or decreased at the discretion of the ECO in consultation with the Engineers Representative
- Submit independent reports to the DEA and other regulating authorities regarding compliance with the requirements of the EMPr, EA and other environmental permits.
- The ECO must keep record of all activities on site, problems identified, transgressions noted and a schedule of tasks undertaken by the ECO (daily diary).

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient. However, in the absence of the ECO there should be a designated owner's environmental officer present to deal with

any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractors and Service Providers: It is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor will appoint an Internal Environmental Officer (EO) who will be responsible for informing contractor employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Internal Environmental Officer and Contractor's obligations in this regard include the following:

- Must be fully knowledgeable on all environmental features of the construction site and the surrounding environment.
- Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation.
- Be fully knowledgeable with the contents with the EMPr.
- Be fully knowledgeable of all the licences and permits issued to the site.
- Ensure a copy of the Environmental Authorisation and EMPr must be easily accessible to all on-site staff members.
- Ensure contractor employees are familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
- Ensure that prior to commencing any site works, all contractor employees and sub-contractors must have attended an environmental awareness included in the induction training which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor
- Manage the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports.
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken, including those of the Independent ECO.
- Staff will be informed of environmental issues as deemed necessary by the Independent ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- Ensuring adherence to the environmental management specifications.
- Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken.
- Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMPr.
- Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- Ensuring that a register of all public complaints is maintained.
- Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful

implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

7.2. Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE 2: Minimise impacts related to inappropriate site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project Component/s	» Area infrastructure (i.e. PV panels, substation, inverters, transformers, switchgear and ancillary buildings). » Linear infrastructure (i.e. underground cabling, overhead power lines and existing access road re-alignment, internal access roads and fencing).
Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species.
Activities/Risk Sources	» Any unintended or intended open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	Contractor	Site establishment, and duration of construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
The electrical fencing should be constructed in manner which allows for the passage of small and medium sized mammals and small avifauna. Steel palisade fencing (20 cm gaps min) is a	Contractor	Site establishment

Mitigation: Action/Control	Responsibility	Timeframe
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 30cm above the ground which should be sufficient to allow smaller animals, reptiles and tortoises to pass through (tortoises retreat into their shells when electrocuted and eventually succumb from repeated shocks), but still remain effective as a security barrier.		
If electrified strands are to be use, there should be no strands within 20 cm of the ground because tortoises retreat into their shells when electrocuted and eventually succumb from repeated shocks	Contractor	Site establishment
The construction camp used to house equipment must be located in a disturbed area and must be screened off as far as practical during the entire construction phase.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All development footprints should be appropriately fenced off and clearly demarcated.	Contractor	Site establishment, and duration of construction
Visual impacts must be reduced during construction through minimising areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soil as closely as possible to their original contour and vegetation.	Contractor	Site establishment, and duration of construction
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but must be temporarily stored in a demarcated area.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers so that the surrounding environment is not polluted (at least one sanitary facility for each sex and for every 30 workers as per the 2014 Construction Regulations; Section 30(1) (b)) at appropriate locations on site). The facilities must be placed within the construction area and along the road.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities must not be located within 100 m from a watercourse or within the 1:100 year flood line without the relevant water use licensing.	Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction
Foundations and trenches must be backfilled to originally excavated materials as much as possible. Excess excavation materials must be disposed of only in approved areas, or, if suitable, stockpiled for use in reclamation activities.	Contractor	Site establishment, and duration of construction and rehabilitation

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE 3: Appropriate management of the construction site and construction workers

Approximately 10 - 75 people are expected to be required during the construction phase which is expected to take place over a period of 6 months. Of these 10 - 75 people, require the 10% are skilled experts, 10% are semi-skilled and 80% are low skilled staff. Staff can be transported around the site using utility vehicles and a typical mini bus to transport staff from nearby towns of Pofadder and Kakamas as well as from the surrounding community of Augrabies which is closest to the site.

Security personnel will be deployed on a shift basis. Contractors and their employees are expected to be accommodated at existing accommodation facilities in the study area or within an appropriately sited construction camp. Construction equipment will need to be stored at appropriate locations on site.

In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the BA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

Project Component/s	» PV facility. » Contractors' camp. » Laydown areas. » Access roads » Power line. » On-site substation. » Ancillary buildings.
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
No vehicles to refuel within washes/ riparian vegetation.	Contractor	Construction
The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified by the Basic Assessment studies. The location of this construction equipment camp/s must be approved by the project ECO.	Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan (refer to **Appendix F)** to be developed with emergency procedures in the event of a fire.	Contractor	Erection: during site establishment Maintenance: duration of contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal	Contractor	Maintenance: duration of contract within a particular area
The terms of this EMPr and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts.	Proponent	Tender process
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	During construction.
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Duration of contract
Ensure waste containers are maintained and emptied as and when required.	Contractor	Site establishment, and duration of construction
A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.	Contractor	Construction
No one other than the ECO or personnel authorised by the ECO may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
No unsupervised open fires are permitted on site and construction personnel must be made aware of the consequences of starting a fire on site to avoid damage to neighbouring farms.	Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Workers must be aware of the importance of not polluting rivers or wetlands and the significance of not undertaking activities that could result in such pollution, and this awareness must be promoted throughout the construction phase.	Contractor and EO	Pre-construction Construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s	Pre-construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction camps have avoided sensitive areas, as approved by the ECO. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not undertaken. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the EO. » Proof of disposal of sewage at an appropriate licensed wastewater treatment works. » Proof of disposal of waste at an appropriate licensed waste disposal facility. » An incident reporting system should be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout construction phase by the EO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 4: Maximise local employment and business opportunities associated with the construction phase

Limited employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction activities associated with the establishment of the PV facility.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » The inflow of various specialists from outside the study area and even abroad. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
Enhancement: Target/Objective	» The developer should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors.

Mitigation: Action/Control	Responsibility	Timeframe
Employment of local community members (i.e. source labour from within the municipal area focused on the communities in closest proximity to the site) should be undertaken where possible.	The developer, Local Municipality, Contractor	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and developer in identifying people whose skills may correspond with the required job specifications.	The developer, Local Municipality, Contractor	Pre-construction
An equitable process should be promoted whereby locals and previously disadvantaged individuals (including women) are considered for employment opportunities.	The developer, and Local Municipality	Duration of construction
Create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the construction process.	The developer, Local Municipality, Contractor	Pre-construction
Identify potential opportunities for local businesses.	Proponent	Pre-construction
Tender documentation (if any are required) should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	The developer, Contractor	Pre-construction
A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour.	The developer, and Contractor	Pre-construction
Skills training and capacity building should be embarked upon from the onset of the construction phase and even prior to the construction phase if possible (as mentioned above)	The developer, and Contractor	Pre-construction and construction
Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations.	The developer	Pre-construction and construction

Performance Indicator	» Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » SMMEs are awarded contracts, where possible, during the construction phase. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities regarding unrealistic employment opportunities or that only outsiders were employed. » Employment and business policy document that sets out local employment and targets completed before construction phase commences.
Monitoring	» Monitor indicators listed above to ensure that they have been met for the construction phase. » The developer and EPC contractor must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes.

OBJECTIVE 5: Maximise capacity building and skills training, and address economic inequities within the study area

As the construction phase would involve unskilled, semi-skilled, and skilled workers, it is likely that locals could be sourced for the unskilled and semi-skilled positions. Due to the high unemployment figures in the study area, it is clear that there would be various unemployed persons in search of employment, even if they can only secure temporary positions. For the lower level skilled positions, outsiders would thus definitely not have to be externally sourced. Even though all that would be employed might not have the necessary applicable skills, this issue could be addressed through proper focussed skills training and capacity building initiatives after locals have been sourced, but prior to construction activities starting.

Project Component/s	» Availability of required skills in the local communities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business could be maximised.
Activities/Risk Sources	» Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Higher skilled positions might be sourced internationally.
Mitigation: Target/Objective	» Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building

Mitigation: Action/Control	Responsibility	Timeframe
The developer, in discussions with the local municipality, should aim to employ a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible.	The developer, Contractor, and Local Municipality	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations in identifying people whose skills may correspond with the job specifications.	Contractor, and Local Municipality	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
In cases for the semi-skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	The developer, Contractor, and Local Municipality	Duration of construction
A proactive consultative skills-audit should be undertaken in the local communities where job creation is currently a significant need.	The developer, and Local Municipality	Pre-construction, and construction
Appropriate training should be provided as per a decided upon skills development plan (refer back to pre-construction objective) to narrow the gap between skills and demand. It is preferable that training be of such a nature that the skills thereby acquired are transferable and of real benefit in other employment contexts.	The developer, and Local Municipality	Pre-construction, and construction

Performance Indicator	» A skills development plan is developed. » Job opportunities, especially of lower skilled positions, are primarily awarded to members of local communities. » Skills training and capacity building initiatives are developed and implemented. » Local SMMEs and/or entrepreneurs awarded the opportunity to become involved in the tender process.
Monitoring	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 6: Minimise the impact of the inflow of an outside workforce and job seekers into the study area

The inflow of jobseekers to the proposed site would be the greatest during the peak construction period of the PV facility, but also when the construction activities of the other large construction projects are becoming less intensive. Other possible negative impacts due to the workforce's presence in the area and especially when jobseekers come to the area would include misconduct of workers, trespassing of workers on privately owned farms, the possible increase in crime, littering, increase in traffic, increase in noise, the development of informal vending stations, and poaching of livestock.

Project Component/s	» Inflow of an outside workforce and jobseekers.
Potential Impact	» The inflow of outsiders and jobseekers could result in negative impacts on the surrounding property owners and local communities, and could even lead to conflict between the locals and these outsiders.
Activities/Risk Sources	» Outside workforce and jobseekers come into conflict with locals, their presence leads to environmental pollution and possibility of them remaining in the area (without proper housing facilities) after construction has ceased. This would put additional pressure on the existing infrastructure and services. » Locals are not employed, which would increase the probability of the impacts of conflict occurring.
Mitigation: Target/Objective	» A limited number of outsiders employed. » Pro-active measures in place to deal with possible jobseekers.

Mitigation: Action/Control	Responsibility	Timeframe
Implement a transparent approach and open consultation with adjacent property owners, prior and throughout the construction period in order to provide a platform where grievances or requests can be addressed before issues become contentious.	Contractor	Pre-construction, construction
Construction workers falling within the semi-skilled to unskilled category should be sourced from the local population where possible.	Contractor	Construction
Local labourers should remain at their existing residences.	Contractor	Construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), should be informed of the details of the contractors, size of the workforce and construction schedules.	The developer	Pre-construction, construction
On-site security should be active prior to the construction phase.	The developer	Pre- construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction
Sufficient water and sanitation facilities should be provided for the workers on site during the construction phase.	Contractor	Construction
The construction site should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	Contractor	Construction
The construction site should be appropriately fenced.	Contractor	Pre-construction
The applicant, local leaders, and the Local Municipality should jointly develop a strategy to minimise the influx of jobseekers to the area.	The developer, local leaders and Local Municipality	Pre-construction, construction
Informal vending stations should not be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station.	Contractor	Construction
Information distributed as part of the existing HIV/Aids awareness campaigns in the area should again be focused on and communicated to the local workforce.	The developer, and Contractor	Construction
Develop a transparent communication and recruitment process to minimise the influx of jobseekers to the area.	The developer, and Contractor	Pre-construction
The recruitment process and the use of contractors should be clearly communicated to the local communities.	The developer	Pre-construction
The communication strategy should ensure that unrealistic employment expectations are not created.	The developer, and Contractor	Pre-construction, construction

Performance Indicator	» Locals are employed where possible. » Reports are not made from members of the local communities regarding unrealistic employment opportunities and/or negative intrusions or even possible increase in crime. » Sound environmental management of the construction site. » No conflict between outsiders, jobseekers, and local community members.
Monitoring	» KSE and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 7: Minimise impacts related to traffic management and transportation of equipment and materials to site

The components will be transported to site (in sections and components). The following civil engineering construction equipment will be required on site (e.g. excavators, trucks, ready mix cement trucks, etc.) as well as components required for the establishment of the switchgear.

The impact of the heavy vehicles associated with the proposed PV facility could add to some of the pressure on the road capacity and road surface, although to a limited extent. The increase in heavy vehicle traffic during the construction phase is not anticipated to significantly impact on the daily living and movement patterns of residents or the landowner or when these vehicles move through town, as the movement associated with this project would be of a limited and intermittent extent.

Project Component/s	» Delivery of any component required within the construction phase.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix concrete to the site. » Mobile construction equipment movement on-site.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the construction of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a construction period traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted (**refer to Appendix G**). The plan must be submitted to the Department of Roads and Public Works prior to any construction activities	The developer and EO	Pre-construction
The traffic management plan (**Appendix G**) reflect (not necessarily all) the following: peak traffic levels expected during construction and include but not limited to: Normal dry/wet blading schedule, special blading e.g. rip and re-compact areas, cutting of drainage swales areas, re-gravelling of roads, spot re-gravelling of powder potholes or mud potholes, cleaning of drainage structures, vegetational control, road sign erection,	The developer and EO	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
replacement and washing if needed, and maintenance of road signs		
Gravel roads should be sprayed with water to limit dust creation if economically feasible and reasonable from an environmental perspective (water scarce area), or an appropriate dust suppressant should be used.	Contractor and EO	Construction
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.	The developer and EO	Planning and design
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	The developer, Contractor and EO	Construction
A designated access to the proposed site must be used to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep any new hard road surfaces as narrow as possible.	Contractor	Duration of contract
All construction vehicles must remain on properly demarcated roads. No construction vehicles must be allowed to drive over the vegetation except where no clear roads are available. In such cases a single track must be used and multiple paths must not be formed.	Contractor	Duration of contract

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard.

	» Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed EO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 8: Minimise the potential impact on health, safety and security

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities. Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.

The actual safety of construction workers is also of concern. Further health and safety issues associated with the actual construction site include unauthorised entry to the site and construction areas, the usage of large equipment on site, the risks associated with the storage of equipment and material on site, as well as the increased risk of accidents due to the increased movement of construction vehicles on the local roads.

Other concerns relate to littering, unwanted behaviour of construction workers, transmission of Sexually Transmitted Diseases (STDs), environmental pollution, an increase risk in fires and so forth. Although such perceptions cannot be substantiated or be changed it should be sensitively dealt with. It is thus clear that even though the construction phase when these impacts could occur is only of a short duration, the effects of the impacts could remain in the medium term.

Project Component/s	» Solar field. » Contractors' camps. » Access roads » Laydown areas. » Inflow of workers could result in increased safety and security risks.
Potential Impact	» Outside workers are involved in criminal activities and/or fires occur.
Activities/Risk Sources	» Theft of construction material. » On-site accidents. » Spread of sexually transmitted diseases. » Littering and environmental pollution.
Mitigation: Target/Objective	» Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

Mitigation: Action/Control	Responsibility	Timeframe
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	Contractor	Pre-construction
Screening of applicants could lessen perceived negative perceptions about the outside workforce.	Contractor	Pre- construction
On-site security should be active prior to the construction phase.	Contractor	Pre- construction
All staff should undergo a general Health and Safety induction and simplified environmental awareness training session	Contractor (and sub-contractor/s)	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant act.	Contractor (and sub-contractor/s)	Duration of contract
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule, and movement of workers.	Developer/Owner and Contractor	Construction
The construction site should be fenced and access to the area controlled.	Contractor	All phases of project
Informal vending stations should not be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station.	Contractor	Construction
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners and the Local Municipality	Developer/Owner, Local Municipality, and local communities	Pre- construction and when required
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Appropriate fire-fighting equipment must be present on site and members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires	Contractor	Construction
The construction site and accommodation facility should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	Contractor	Construction
Construction activities should not interfere with the activities on surrounding properties.	Contractor	Construction

Performance Indicator	» No criminal activities and theft of livestock attributable to the construction workforce are reported.' » Limited intrusions on surrounding property owners. » No reports from property owners regarding problems with construction activities and workforce. » No fires or on-site accidents occur.
Monitoring	» The Owner, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 9: Minimise the potential impact on the daily living and movement patterns

Changes or disruptions in the daily living and working activities of residents, especially the landowner (Stephanus Nel) is most likely to occur during the construction phase and are likely to include the following:

» *Noise and dust pollution* - During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the site as well as main and internal access roads. The

intensity of the negative impacts, would, however depend on the wind direction and timing of construction activities.

» *Transportation routes* - The number of vehicular traffic resulting from the proposed project.

Project Component/s	» Construction activities associated with the area and linear infrastructure. » Batching plant. » Vegetation clearing. » Delivery of any component required within the construction phase.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads. » Possible increase in dust, noise, and general intrusion.
Activities/Risk Sources	» Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» Limit any negative impacts on the surrounding property owners' daily living and movement patterns. » Minimise impact of traffic associated with the construction of the facility on local traffic volume, existing infrastructure, property owners, animals, and road users. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/Control	Responsibility	Timeframe
Adequate parking for all employees, contractors and sub-contractors will be made available and should not impact negatively on neighbouring farmers.	Contractor	Pre-construction and construction
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users and to limit any accident risks. Additional access roads should be kept to a minimum.	Contractor	Pre-construction and construction
Source general construction material and goods locally where available to limit transportation over long distances.	Contractor	Construction
Local labourers should be used during the construction phase to limit the inflow of outsiders to the area.	Contractor	Construction
Construction activities should not interfere with the farming activities on surrounding properties.	Contractor	Construction
Compile and implement a traffic management plan (Refer to **Appendix G** for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted.	Contractor	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Gravel roads and cleared areas should be sprayed with an appropriate dust suppressant, if deemed necessary, to limit dust creation.	Contractor	Construction
Dust abatement techniques must be used before and during surface clearing, excavation or blasting activities.	Contractor	Site preparation Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Developer/Owner	Construction
Should abnormal loads have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government.	Contractor (or appointed transportation contractor)	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimise impacts on local commuters consideration must be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.	Contractor	Duration of contract
Ensure that any damage to internal roads because of construction activities is repaired before completion of the construction phase.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered with suitable material.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the contractor.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Dust suppression techniques must be implemented on all exposed surfaces during periods of high wind. Such measures may include wet suppression, chemical stabilisation, the use of a	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
wind fence, covering surfaces with straw chippings and re-vegetation of open areas.		

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility). » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis. » A complaints register must be maintained, in which any complaints from neighbouring farmers will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon.
Monitoring	Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods: » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident register and non-conformance must be used to record incidents and non-conformances to the EMPr. » A complaints register must be used to record grievances by the public.

OBJECTIVE 10: Minimisation of development footprint and disturbance of topsoil

Project Component/s	» PV Panels » Underground cabling » Ancillary buildings » Temporary access roads and the re-aligned road to the site » Short overhead power line connecting to the grid
Potential Impact	» Impacts on natural vegetation. » Loss of indigenous natural vegetation due to construction activities. » Impacts on soil. » Loss of topsoil
Activity/Risk Source	» Vegetation clearing » Site preparation and earthworks. » Excavation of foundations. » Construction during the re-alignment of the access road. » Construction of underground cabling. » Site preparation (e.g. compaction). » Foundations or PV panel equipment installation. » Stockpiling of topsoil, subsoil and spoil material.

Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats on-site » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise loss of topsoil. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.	EO and Contractor	Site establishment and duration of contract
In terms of best practice and for rehabilitation purposes, it is essential that a 150mm layer of topsoil from the building footprints (i.e. the on-site substation and contractor's site camp) be stripped and stockpiled prior to the commencement of construction activities in each area.	EO and Contractor	Site establishment and duration of contract
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna is restricted.	Contractor	Site establishment and duration of contract
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractors in consultation with the EO	Duration of Construction
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment and duration of contract
Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.	EO and Contractor	Site establishment and duration of contract
No-Go areas are to be demarcated with tape and warning signs prohibiting access erected. Plant and vehicle operators must be instructed by the ESA and EO on where these No-Go sites are.	EO and Contractor	Construction
No vegetation removal must be allowed outside the designated project development footprint.	EO and Contractor	Construction
Topsoil underneath the panel arrays must be left in situ as low impact pile installation is to be used for the panels..	EO and Contractor	Construction
All fill material must be sourced from a commercial off-site suitable/permitted and authorised source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site. Permits must be kept on site.	EO and Contractor	Duration of contract
Top soil and subsoil must be stockpiled separately and replaced according to the correct profile, i.e. topsoil replaced last. Stockpiles must not be situated such that they obstruct natural water pathways and drainage channels.	Contractor	Site establishment and duration of contract
Top soil stockpiles must not exceed 2m in height.	Contractor	Site establishment and duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months. Stockpiles older than 6 months must be enriched before they can be used to ensure the effectiveness of the topsoil.	Contractor	Site establishment and duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Ridges and areas which include protected and red data species must be avoided at all costs during construction, unless the necessary permits are obtained.	EO	Pre-construction; Site establishment
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
Topsoil must be stockpiled and managed in terms of the erosion management plan (**refer to Appendix C**).	Contractor	Duration of contract
A site rehabilitation programme must be developed and implemented.	EO and Contractor in consultation with Ecologist	Duration of contract
Disturbed areas should be rehabilitated when construction in an area is completed. Rehabilitated areas must be inspected on a monthly basis and maintained, if necessary	EO and Contractor	Rehabilitation; Post-construction
Topsoil used for rehabilitation purposes should be reused to mitigate disturbed areas and should not be mixed with sub-soils.	EO and Contractor	Rehabilitation; Post-construction

Performance Indicator	» Zero disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored
Monitoring	» Observation of vegetation clearing activities by EO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 11: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion;
» Incorrect storage of topsoil;
» Accidental spillages;
» Poor rehabilitation;
» Erosion from rainwater;
» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere; and
» Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged

Project Component/s	» PV Panels. » Underground cabling. » Ancillary buildings. » Construction during the re-alignment of the access road » Overhead power lines.
Potential Impact	» Soil and rock degradation.

	» Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » High velocity discharge of water from construction activity.
Mitigation: Target/Objective	» Minimise extent of disturbance areas. » Minimise activity within disturbance areas. » Minimise soil degradation (mixing, wetting, compaction, etc.). » Minimise soil erosion. » Minimise deposition of soil into washes as a result of runoff. » Minimise instability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Identify disturbance areas and restrict construction activity to these areas.	EO and Contractor	Before and during construction
A method statement must be developed and submitted to the engineer to deal with erosion issues prior to bulk earthworks operations commencing	EO and Contractor	Before and during construction
During construction the contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas	EO and Contractor	During construction
No goods or equipment shall be stored in the washes (as identified by the biophysical specialist) that may accompany peak rainfall events	EO and Contractor	Throughout the duration of the project
Rehabilitate disturbance areas as soon as practicable when construction in an area is complete.	EO and Contractor	During and after construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	EO and Contractor	Design and construction
Minimise removal of vegetation which adds stability to soil.	EO and Contractor	Construction
Erosion and loss of soil must be prevented by minimizing the construction site exposed to surface water run-off. Where necessary erosion stabilizing actions such as gabions or re-vegetation must be implemented to prevent further habitat deterioration.	EO and Contractor	Pre-Construction, Construction and throughout the duration of the project
Protective measures must be installed where there are possibilities of surface water sheet flow causing erosion.	EO and Contractor	Erection: Before construction Maintenance: Duration of contract
Stabilisation of cleared areas to prevent and control erosion shall be actively managed. This includes: Brush cut packing, mulch or chip cover, straw stabilising, watering, planting/sodding, hand seed-sowing of locally-occurring indigenous species, hydroseeding of locally-occurring indigenous species, soil	EO and Contractor	Erection: Before construction Maintenance: Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
binders and anti-erosion compounds, gabion bolsters and mattresses for flow attenuation, geofabric, hessian cover and log/ pole fencing		
Erosion control measures: Run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, shade nets, gabions or temporary mulching over denuded area as required.	EO and Contractor	Erection: Before construction Maintenance: Duration of contract
No soil is to be stripped from areas within the site that the contractor does not require for construction works.	EO and Contractor	Construction
Anti-erosion measures such as silt fences must be installed in disturbed areas.	Contractor	Construction
Erosion control measures to be regularly maintained.	EO and Contractor	Construction
Regular monitoring for erosion must take place 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 as outlined in the erosion management plan (**Appendix C**).	EO and Contractor	Construction and operation

Performance Indicator	» No activity outside demarcated disturbance areas. » Limited soil erosion around site. » No increase in siltation in washes as a result of construction activities. » No activity in restricted areas.
Monitoring	» Limited level of soil erosion around site. » Acceptable state of excavations, as determined by the EO » Monthly inspections of sediment control devices by the EO » Monthly inspections of surroundings, including washes (outside the development area) by the EO. » An incident reporting system will record non-conformances.

OBJECTIVE 12: Minimise the impacts on and loss of indigenous vegetation

The Ecology Walk-Through report (**Appendix K**) identified *Acacia erioloba* and *Boscia foetida* on site. Other species protected under legislation were identified in the general area but not on the Skuitdrift 1 Solar PV Energy Facility development footprint. These include *Aloe dichotoma* (Quiver Tree) and *Hoodia gordonii* (Bokhorings).

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	» Vegetation clearing. » Construction during road re-alignment. » Construction of overhead power line. » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.

Mitigation: Target/Objective	» Minimise footprints of disturbance of vegetation/habitats. » Minimise loss of protected and indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Vegetation clearing must be limited to the required footprint for actual construction works and operational activities. Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.	Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
Search and Rescue (S&R) of all protected plants that will be affected by the development (**Appendix H**), especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions), should take place. The necessary permits must be in place » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately to a suitable habitat. Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment	Contractor	Duration of construction
Monitor and control declared weeds and invader species. Continually monitor the re-emergence of these species and manage according to the invasive species management plan (**Appendix J**).	Contractor	Duration of construction

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation » Ecosystem fragmentation is kept to a minimum. » Ecosystem functionality is retained and any degradation prevented. » Re-establishment of rescued species.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 13: Prevent damage to drainage areas (Washes)

The hydrological features, or "washes", which occur within the Skuitdrift 1 Solar PV Energy Facility development footprint, are not considered to be drainage lines or water courses as they do not have a defined flood plain areas nor associated soil or vegetation. However, construction within areas where 'washes' are present must be minimised as far as possible. Where impacts are unavoidable, mitigation measures are required to minimise impacts on these systems.

In order to prevent damage to the washes in the development footprint the final layout and construction should be planned carefully and the detailed design to avoid impacts on the washes which occur on the site.

Project Component/s	» Power line » PV Panels » Ancillary buildings/infrastructure » Underground cabling » Any activity that could result in a disturbance or loss of the washes, natural vegetation and change soil properties e.g. construction of solar facility infrastructure, access road re-alignment, power line.
Potential Impact	» Disturbance or loss of drainage areas during the construction and operational phase results in a loss of biodiversity and habitat; increases declared weed and alien invasive plant species; increases soil erosion; and disrupts natural faunal populations. » Damage to water course areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the watercourse as a natural system.
Activities/Risk Sources	» Construction and operation of the overhead power line, PV panels and ancillary buildings and infrastructure. » Excavation for underground cabling.
Mitigation: Target/Objective	» No damage to the delineated watercourses (i.e. wetlands and washes) within project footprint. » Minimise damage to watercourse areas where crossings are to be built or upgraded.

Mitigation: Action/Control	Responsibility	Timeframe
Wetlands, drainage lines, rivers and river riparian areas must be treated as 'no-go' areas in terms of vehicles, machinery, personnel, construction material (materials required for the installation and construction of infrastructure), fuel, oil, bitumen or waste (including waste water).	Contractor	Construction Phase
The larger washes at the site should not be built over, and a 32m buffer, which would provide 30m corridors around the larger washes, are deemed adequate. Any infringement on the washes from the project must be undertaken in line with the requirements of the Water Use License for the facility.	Contractor	Construction Phase
If possible, construction activities must be prioritised to the dry months of the year (June - August) to limit mobilisation of	Contractor	Construction Phase

Mitigation: Action/Control	Responsibility	Timeframe
sediments or hazardous substances from construction vehicles used during site clearing		
Any construction work that involves site clearance, digging or trenching during installation services should be suspended during heavy rains to avoid erosion and sedimentation of the water course	Contractor	Construction Phase
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	Proponent and contractors, EO	Duration of construction
When wet season construction cannot be avoided, sedimentation control measures, such as hay bales, sedimentation basins or any silt trap method should be in place during digging and the installation of service infrastructure	Contractor	Construction Phase
The denuded and disturbed site should be re-vegetated as soon as possible.	Contractor	Construction Phase
In instances where vegetation clearing is required for construction along identified washes, a 5-10m buffer must be implemented for the protection of the sensitive flora. Where vegetation clearance is required this must be done in-line with relevant permits.	Contractors, EO	Duration of construction
Control storm water and runoff water through the implementation of a storm water management plan for the site.	Contractors, EO	Duration of construction

Performance Indicator	» The continued presence of drainage areas within the development area and the absence of surface impacts within these parts. » No impacts on water quality, water quantity, riparian vegetation, natural status of watercourses
Monitoring	» Habitat loss in watercourses should be monitored before and after construction. » The presence and development of erosion features downstream of any construction through wetlands must be monitored. » The ECO should be responsible for driving this process. » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site. » Implement a monitoring programme of which the aims and objectives should be to monitor: * Compliance to the approved EMPr; * Status of hydrological features on site; * Status of impacts within sensitive areas; and * Seasonal biodiversity (species richness) surveys.

OBJECTIVE 14: Minimise the establishment and spread of alien invasive plants

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices (Zachariades et al. 2005). Consequences of this may include:

» Loss of indigenous vegetation;
» Change in vegetation structure leading to change in various habitat characteristics;

- Change in plant species composition;
- Change in soil chemical properties;
- Loss of sensitive habitats;
- Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
- Fragmentation of sensitive habitats;
- Change in flammability of vegetation, depending on alien species;
- Hydrological impacts due to increased transpiration and runoff; and
- Impairment of wetland function.

The Skuitdrift 1 Solar PV Energy Facility development site is relatively free of alien plant species, which can be ascribed firstly to the aridity of the site, as well as the low rainfall in the period preceding the site visit. Alien plants are however likely to become an issue if the site is highly disturbed during construction or if water runoff is not properly managed. Mitigation measures have been recommended to avoid the risk of increased alien invasion during construction and operation phases of the solar facility.

An integrated Alien Invasive Management Plan is attached as **Appendix J**

Project Component/s	» Solar facility. » Subcontractor's camps. » Laydown areas. » Temporary access roads.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species. » Impacts on soil. » Impact on faunal habitats. » Degradation and loss of agricultural potential.
Activities/Risk Sources	» Transport of construction materials to site » Movement of construction machinery and personnel » Site preparation and earthworks causing disturbance to indigenous vegetation » Construction of site access road » Stockpiling of topsoil, subsoil and spoil material » Routine maintenance work – especially vehicle movement
Mitigation: Target/Objective	» To significantly reduce the presence of weeds and eradicate alien invasive species » To avoid the introduction of additional alien invasive plants to the project control area » To avoid further distribution and thickening of existing alien plants on the project area » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the project control area

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction and operation
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act)	Contractor	Construction and operation

Mitigation: Action/Control	Responsibility	Timeframe
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.
Monitoring	» On-going monitoring of area by EO during construction. » On-going monitoring of area by environmental manager during operation. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » The environmental manager/site agent should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 15: Minimise the impacts on fauna

Faunal species are indirectly affected by the overall loss of habitat as direct construction impacts can often limit the movement of individuals from the path of construction.

With respect to any threatened species, the loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species, unless they are classified as threatened. In the case of threatened animal species, the loss of a population or individual could lead to a direct change in its conservation status. This may arise if the proposed infrastructure is located where it will affect such individuals or populations or the habitat that they depend on. Consequences may include fragmentation of populations of affected species; reduction in area of occupancy of affected species; and loss of genetic variation within affected species.

Project Component/s	» Solar facility. » Contractor's camp and laydown area.
Potential Impact	» Loss or displacement of fauna » Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site.
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or PV equipment installation. » Mobile construction equipment. » Underground cabling and road construction activities.
Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing/disturbance.	Contractor in consultation with the ECO or ESA	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment and duration of contract
Animals that cannot flee from the affected areas by themselves (if any) must be removed from the affected areas to a safe location before the start of site clearing/construction and relocated to safe areas. This must be undertaken by a suitably qualified person.	Contractor in consultation with the ECO/qualified person	Site establishment and duration of contract
Excavations must be inspected daily in order to rescue trapped animals	Contractor in consultation with the ECO	Site establishment and duration of contract
Vehicles to adhere to speed limits at all times	Contractor	Construction Operation
The intentional harming or killing of animals will be prohibited through on-site supervision and worksite rules.	Contractor	Construction Operation
Ensure storage water reservoirs are covered, or bird deterrent measures are used.	Contractor in consultation with Specialist	Duration of contract
Implement a faunal removal plan/ rescue plan with designated/ trained personnel and contact numbers.	Contractor	Duration of contract
All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity. » The trenches must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed by a suitably qualified person in a safe manner, unharmed, and placed in an area where the animal will be comfortable. All mammal, large reptiles and avifauna species found injured during construction must be taken to a suitably qualified veterinarian or rehabilitation centre to either be euthanized in a humane manner or cared for until it can be released again.	Contractor	Duration of construction

Performance Indicator	» No disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on faunal species (i.e. noted/recorded fatalities)
Monitoring	» Observation of vegetation clearing activities by EO throughout construction phase. » Supervision of all clearing and earthworks. » Recording faunal fatalities to monitor success of relocation efforts. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 16: Minimise impacts on water resources

Project Component/s	» Construction activities » Storage of chemicals and hazardous materials. » Ablution facilities.
Potential Impact	» Pollutants such as hydrocarbons could be harmful to aquatic biota, particularly during low flows when dilution is reduced.
Activity/Risk Source	» Fuelling, usage and maintenance of construction vehicles. » Labourers using ablution facilities. » Use of any chemicals or hazardous materials during construction.
Mitigation: Target/Objective	» No incidents related to spills of chemicals and hazardous materials. » No release of contaminated water in washes. » No misbehaviour of construction workers (i.e. ablution activities, washing) » Minimise dust disturbance.

Mitigation: Action/Control	Responsibility	Timeframe
A buffer zone of 32 m must be maintained around the washes at all times.	Contractor	Pre-construction
Wetlands, drainage lines, rivers and river riparian areas must be treated as no-go areas in terms of vehicles, machinery, personnel, construction material (materials required for the installation and construction of infrastructure), fuel, oil, bitumen or waste (including waste water).	Contractor and EO	Pre-construction Construction
Implement strict management of all hazardous materials used on site.	Contractor	Construction
Ensure strict management of potential sources of pollution (hydrocarbons from vehicles and machinery, cement during construction, etc.).	Contractor	Construction
No potable water may be used for damping haul roads	Contractor	Construction
In order to avoid resource contamination concrete batching should not be located within 60m of a watercourse, within a watercourse flood plain, near a wetland area or where there is a potential for any spilled concrete to enter a watercourse or groundwater (boreholes)	Contractor in consultation with the EO	Construction
Should water be used for dust suppression on gravel roads, it must be of a quality compliant with the General Special Effluent Standards (31/03/2009): Temperature: max.25C, pH: between 5.5 and 7.5 and conductivity: not be increased more than 15% above the intake water and not exceed 250 milli-Siemens per metre (determined at 25C). The water used for dust suppression is likely to be borehole water, and not treated effluent. However the water quality standards mentioned will be taken note of.	Contractor in consultation with the EO	Construction
No unauthorised groundwater abstraction may occur on site.	Contractor	Construction
Should any water be discharged from the site, the water is to comply with national effluent standards. No contaminated water may be discharged from site.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Potentially contaminated water originating from site must be directed through an oil and water separator. Oil is to be removed and/or recycled from/on site by a licensed contractor.	Contractor	Construction
Proper use of chemical toilets should be strictly enforced.	Contractor	Construction
No activities shall be allowed to encroach into a water course or wetland/pan without a Water Use License being in place from the Department of Water and Sanitation (DWS).	Contractor Developer/Owner	Design Construction
No spoil material, including stripped topsoil, must be temporarily stockpiled within 50m of freshwater systems.	Contractor in consultation with the EO	Design Construction
Internal access roads must be located to minimise stream crossings. All structure crossing streams must be located and constructed so that they do not decrease channel stability or increase water velocity.	Contractor in consultation with the EO	Design Construction

Performance Indicator	» No spillages are recorded » No unauthorised use of water is conducted » Where water is extracted and requires a licence, one must be applied for
Monitoring	» Monitor management measures in place for potentially hazardous materials » No excess or unauthorised use of water sources

OBJECTIVE 17: Appropriate Stormwater Management

The stormwater management is covered under the Pre-construction and construction phase management, but aspects thereof will also continue into the Operational Phase. It is important that the engineers and contractors responsible for the detailed design of the Stormwater Systems must take into account the requirements of this EMP, as well as the recommendations by the participating specialists.

Due to the extremely low annual rainfall the risk of water erosion is very low. The condition of the ground for the site as well as broader Scuitdrift area is such that any surface water is very quickly absorbed into the soil, as such this substantiates that water build up on the surface is minimal to none and practically eliminates any water flow which might cause water erosion.

An integrated Stormwater Management Plan is attached as **Appendix E**

Project Component/s	» Alteration of sandy substrata into hard surfaces impacting on the local hydrological regime
Potential Impact	» Poor stormwater management and the alteration hydrological regime
Activities/Risk Sources	» Placement of hard engineered surfaces
Mitigation: Target/Objective	» Reduce the potential increase in surface flow velocities and the impact on dry riverbeds and the localised drainage systems

Mitigation: Action/Control	Responsibility	Timeframe
Any stormwater within the site must be handled in a suitable manner, i.e. clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, shade nets, or gabions trapping sediments and reduce flow velocities.	Contractor/ Operator and Engineers	Planning, design and operation
All storm water runoff drains alongside the access road network and channel runoff into nearby drainages must be constructed with "erosion-proof" outlets as designed by the engineer with input from the ECO – the engineer is to determine whether formal drainage is in fact necessary	Contractor and ECO in consultation with specialist	Planning, design and operation
No goods or equipment shall be stored in the washes (as identified by the biophysical specialist) that may accompany peak rainfall events	Contractor	Design Construction and operation
Stormwater structures should as far as possible not concentrate runoff by piped systems or similar	Contractor	Design Construction
Stormwater control systems must be implemented to reduce erosion on the project site.	Contractor	Design Construction
New access roads within the site are to be constructed according to design and contract specifications. The access routes must have suitable stormwater management plans and erosion control measures.	Contractor	Design Construction
Drainage measures must promote the dissipation of storm water run-off.	Contractor/Operator Owner	Design Construction
All stormwater mitigation measures must be implemented according a Stormwater Management Plan.	Contractor	Construction
The stormwater systems must be built to be able to handle a 2-year flood frequency.	Contractor	Design Construction
Landscaping stormwater must be channelled away from all structures. Diversion structures should also be present along the roads to divert water flow away from the roads.	Contractor	Design Construction

Performance Indicator	» No impacts on water quality, water quantity, riparian vegetation, natural status of watercourses » Minimise erosion as far as possible
Monitoring	» Appropriate stormwater management system in place

OBJECTIVE 18: Protection of heritage resources

Despite falling outside of the site area, the Koppies must be avoided during construction activities. The ECO should be made aware of the presence of archaeological resources there so that their safeguarding during construction can be ensured. The presence of a grave to the north of the development area should be demarcated as a No-Go area. The easily recognisable quarts scatter's present near the Koppies, must be avoided during the period of construction, so as to prevent any destruction of the sites.

Should any heritage remains be exposed during excavations, these must be immediately reported to the Provincial Heritage Resource Authority of the Northern Cape, in terms of the national Heritage Resources

Act (Act No. 25 of 1999). Heritage remains uncovered or disturbed during earthworks may not be disturbed further until the necessary guidance and approval have been obtained from the relevant Heritage Authority.

Should any archaeological remains including (but not limited to) fossil bones, fossil shells, coins, indigenous ceramics, colonial ceramics, marine shell heaps, stone artefacts, bone remains, rock art, rock engravings and any antiquity be discovered during construction, they must be immediately reported to South African Heritage Resources Agency and not disturbed further until the necessary guidance and approval have been obtained.

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities.

Project Component/s	» PV Panels. » Transformers and switchgear etc. » Underground cabling. » Ancillary buildings. » Re-aligned access road » Overhead power lines.
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed
Activity/Risk Source	» Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Power line construction activities.
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	Contractor in consultation with Heritage Specialist	Pre-construction
Contractors must be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. All staff should also be familiarised with procedures for dealing with heritage objects/sites.	Contractor, ECO/ESA and heritage specialist	Duration of contract, particularly during excavations
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	Heritage Specialist	Pre-construction
Project employees and any contract staff must maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils (e.g. trace fossils or stromatolites) or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/John Gribble 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Itumeleng Masiteng/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required.	Contractor in consultation with Heritage Specialist	Duration of contract
In the event that fossils resources are discovered during excavations, immediately stop excavation in the vicinity of the potential material. Mark (flag) the position and also spoil that may contain fossils. Inform the site foreman, the EO and the ECO. EO to inform the developer, the developer contacts the standby archaeologist and/or palaeontologist. EO to describe the occurrence and provide images by email.	Contractor and EO	Construction

Performance Indicator	» No disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines
Monitoring	» Observation of excavation activities by SHE throughout construction phase » Supervision of all clearing and earthworks » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites (if required). » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 19: Appropriate handling and management of waste

The construction of the PV facility will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. The main wastes expected to be generated by the construction of the solar energy facility will include:

» general solid waste
» hazardous waste
» inert waste (rock and soil)
» liquid waste (including grey water and sewage)

An integrated Waste Management Plan is attached as **Appendix D**

Project Component/s	» PV Facility. » Underground cabling. » Ancillary buildings. » Access roads » Overhead power line
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging » Other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	» To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works. » Any permits obtained for other ablutions installed (i.e. French drains) obtained prior to commencement of construction

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste must be removed at least weekly for disposal, if feasible; other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at	Contractor	Maintenance: duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
a registered and operational wastewater treatment works. Slips of disposal to be retained as proof of responsible disposal		within a particular area
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered landfill site.	Contractor	During and post construction.
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	Contractor	Duration of contract
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Daily inspection of all chemical toilets and septic tanks must be performed by environmental representatives on site.	Contractor	Duration of contract
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste.	Contractor	Duration of construction
Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	Contractor	Duration of construction
Under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor	Duration of construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the material re-used for an appropriate purpose.	Contractor	Completion of construction
Upon the completion of construction, all sanitation facilities (including chemical toilets) must be removed, as well as the associated waste to be disposed of at a registered waste disposal site.	Contractor	Completion of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately.

	» Provision of all appropriate waste manifests for all waste streams.
Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » Proof of disposal of sewage at an appropriate waste water treatment works. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 20: Appropriate handling and storage of chemicals, hazardous substances

The construction phase may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project Component/s	» Laydown areas. » Subcontractors' camps. » Temporary hydrocarbon and chemical storage areas.
Potential Impact	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation.	Contractor	Pre-construction and implement for duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to: » Designated area; » All applicable safety signage; » Firefighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and Has adequate capacity to contain 110% of the largest container contents.	Contractor	Pre-construction and implement for duration of Contract

Mitigation: Action/Control	Responsibility	Timeframe
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required, a NEMA Section 30 report must be submitted to DEA within 14 days of the incident.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substations must be removed from site by licensed contractors.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	Contractor	Construction
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE 21: Limit direct and indirect terrestrial faunal and avifaunal impacts

Project component/s	Construction activities, operational activities and human presence
Potential Impact	Disturbance of faunal communities due to construction as well as poaching and hunting risk from construction staff.
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
Environmental induction must be given to all staff.	Contractor	Construction and Operation
ECO to monitor and enforce ban on hunting, collecting or harvesting etc. of all plants and animals or their products.	ECO	Construction and Operation
Any fauna encountered during construction should be removed to safety by the ECO or other suitably qualified person.	Contractor	Construction and Operation
All construction vehicles must adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction
Regular surveys of large collision-prone species, especially cranes, flamingos and raptors within the study area to determine the relative importance of local populations of priority taxa.	Contractor	Construction and Operation
The power line must be fitted with the necessary bird flappers as per the Eskom guidelines.	Contractor	Construction and Operation
Insulate live components at support structures	Contractor	Construction

Performance Indicator	» Minimum disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation and habitats for fauna and avifauna. » Limited impacts on faunal species (i.e. noted/recorded fatalities), especially those of conservation concern.
Monitoring	» Monitoring for compliance during the construction phase. All incidents to be noted.

OBJECTIVE 22: Effective management of concrete batching plants

A considerable amount of concrete is required during the construction of the Solar Facility. In this regard there could be a need to establish a batching plant within the site. Turbid and highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. Concrete batching plants, cement, sand and aggregates can produce dust. Potential pollutants in batching plant wastewater and stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	» Batching plant. » Contaminated stormwater system.
Potential Impact	» Dust emissions » Release of contaminated water » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation
Activity/risk source	» Operation of the batching plant » Packaging and other construction wastes » Hydrocarbon use and storage
Mitigation: Target/Objective	» To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

Mitigation: Action/control	Responsibility	Timeframe
Concrete batching plants should be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised	Contractor	Construction phase
Where there is a regular movement of vehicles, access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment	Contractor	Construction phase
Good maintenance practices must be implemented, including regular sweeping to prevent dust build-up	Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	Contractor	Construction phase
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage	Contractor	Construction phase
Process wastewater collected from the entire batching plant area should be diverted to an impervious settling tank or pond. Water should be reused in the concrete batching process, where possible.	Contractor	Construction phase
A contaminated stormwater system must be specifically designed for the batching plant to ensure effective control of contaminated stormwater originating from the batching plant and prevent contamination to the surrounding environment.	Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
Artificial wind barriers must be installed around the batching plant to minimise air, land and water pollution. Wind barriers must enclose the entire batching plant and be at least 2.5m from the NGL and not allow fly ash and other dusts from moving through the barrier. The artificial barrier must be maintained daily for any defects and corrected when necessary.	Contractor	Pre-construction/ construction
The concrete wash bay structure must be constructed in a double brick arrangement or be reinforced to maintain its integrity throughout operation.	Contractor	Construction phase

Performance Indicator	» No complaints regarding dust » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident and non-conformance register will be used to record incidents and non-conformances to the EMPr. » The appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase

7.3. Detailing Method Statements

OBJECTIVE 23: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMP will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able 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 must cover applicable details with regard to:

» Responsible person/s;
» Construction procedures;
» Materials and equipment to be used;
» Getting the equipment to and from site;
» How the equipment/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 Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. Specific areas to be addressed in the method statement: pre, during and post construction include:

- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.
- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions)
- Stormwater method statement.
- Ablution facilities (placement, maintenance, management and servicing)
- Solid Waste Management:
  - Description of the waste storage facilities (on site and accumulative).
  - Placement of waste stored (on site and accumulative).
  - Management and collection of waste process.
  - Recycle, re-use and removal process and procedure.
- Liquid waste management:
- The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into the surrounding environment Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into the surrounding environment occurs. Dust and noise pollution
  - Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
  - Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
  - Lists of all potentially hazardous substances to be used.
  - Appropriate handling, storage and disposal procedures.
  - Prevention protocol of accidental contamination of soil at storage and handling areas.

    - All storage areas, (i.e.: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- Fire prevention and management measures on site.
- Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
    - Rehabilitation, re-vegetation process and bush clearing.
- Incident and accident reporting protocol.
- General administration
- Designate access road and the protocol on while roads are in use.
- Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the ECO and Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

7.4. Awareness and Competence: Construction Phase

OBJECTIVE 24: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that all personnel involved in the project are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The ECO is responsible for ensuring compliance pre, during and post construction and operation. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
- The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity is to have copies of the relevant Method Statements and be aware of the content thereof.
- Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff is aware of the location and have access to the document. Senior site staff will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training session. The training session must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.

- Records must be kept of those that have completed the relevant training.
- Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
- Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

» All sub-contractors must have a copy of the EMPr and sign a declaration/ acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
» Contractors and main sub-contractors should have a basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
» Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
» Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

7.4.1 Environmental Awareness and Induction Training

The EO, in consultation with the contractor, shall ensure that all construction workers receive an induction presentation, as well as on-going environmental education and awareness, on the importance and implications of the EMPr and the environmental requirements it prescribes. The presentation shall be conducted, as far as is possible, in the employees' language of choice. The contractor should provide a translator from their staff for the purpose of translating should this be necessary.

There are a number of protected and conservation-worthy plant species on and in proximity to the solar development site. The Ecology Walk-Through report (**Appendix K**) identified *Acacia erioloba* trees on site. All the *Acacia erioloba* trees encountered (six) are relatively small, three (3) metres or less in height with a narrow crown. Encountered trees were otherwise healthy. *Boscia foetida* was found on site and is listed on Schedule 2 (Protected Species) (**Appendix K**). There are twenty-nine (29) *Boscia foetida* on site. The individuals found were healthy. It is important that the EO is knowledgeable of these species and is able to identify and inform construction staff to be aware of these species and how to identify them, so that they can be suitably avoided and/or protected. It is the EO's responsibility to print enlarged posters of these photographs and description for use in the Environmental Induction / Education training sessions. A permit for their relocation / removal must be sought prior to commencement of construction.

In any case of *Hoodia gordonii* being found within the site, the species must be carefully removed and transplanted outside the development area in proximity to other *Hoodia gordonii* plants.

As further plant species of conservation concern, as well as archaeological occurrences, are likely to occur in proximity of the koppies nearby, the koppie areas are demarcated as no-go areas and must be avoided by all staff.

As a minimum, induction training should include:

- Explanation of the importance of complying with the EMPr;
- Explanation of the importance of complying with the Environmental Authorisation;
- Discussion of the potential environmental impacts of construction activities;
- Awareness regarding sensitivities on the site, including sensitive plant species and washes (including the use of visual aids and on-site indetification);
- The benefits of improved personal performance;
- Employees' roles and responsibilities, including emergency preparedness (this should be combined with this induction, but presented by the contractors Health and Safety Representative);
- Explanation of the mitigation measures that must be implemented when carrying out their activities; and
- Explanation of the specifics of this EMPr and its specification (no-go areas, etc.).

Environmental Awareness Training must take the form of an on-site talk and demonstration by the EO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the EO on site. Proof of awareness training should be kept on record. Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the Contractor's Environmental Officer and should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the EO on site.

7.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and ones recommended by the onsite EO and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

7.5. Monitoring Programme: Construction Phase

OBJECTIVE 25: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency

of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, Scuitdrift Solar Project (Pty) Ltd. will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/ Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

- Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- Ensure adequate and appropriate interventions to address non-compliance
- Ensure adequate and appropriate interventions to address environmental degradation
- Provide a mechanism for the lodging and resolution of public complaints
- Ensure appropriate and adequate record keeping related to environmental compliance
- Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- Aid communication and feedback to authorities and stakeholders

All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the DEA in terms of the Environmental Authorisation, must be submitted to the Director: Compliance Monitoring of the Department.

Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

7.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

7.5.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to the Director: Compliance Monitoring at DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out. The contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the DEA regarding waste related activities.

7.5.3. Audit Reports

The holder of the Environmental Authorisation must, for the period during which the Environmental Authorisation and EMPr remain valid, ensure that project compliance with the conditions of the Environmental Authorisation and the EMPr are audited, and that the audit reports are submitted to the Director: Compliance Monitoring of the DEA.

An environmental internal audit must be conducted and submitted every 3 months and an external audit must be conducted once a year. An annual audit report must be compiled and submitted to DEA until the completion of the construction and rehabilitation. This report must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014, as amended and indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

7.5.4. Final Audit Report

A final environmental audit report must be compiled by the independent ECO and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase i.e. within 30 days of site handover) and within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

CHAPTER 8: MANAGEMENT PROGRAMME: REHABILITATION

Overall Goal: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

8.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE 1: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Construction camps. » Laydown areas. » Access roads. » Ancillary buildings. » Overhead Power line.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas » Temporary access roads/tracks » Other disturbed areas/footprints
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
Implement revegetation and rehabilitation plan (**refer to Appendix I**).	Contractor	Following execution of the works
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
Fencing requirements mentioned in Objective 7 must be adhered to at all times	Contractor	Following completion of construction activities in an area

Mitigation: Action/Control	Responsibility	Timeframe
The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction equipment camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked. The temporary access roads must be rehabilitated.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
All areas of disturbed soil must be reclaimed using only indigenous grass and shrubs.	Contractor	Following completion of construction activities in an area
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation.	Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated as soon as possible after construction and local indigenous plants must be used to enhance the conservation of the existing natural vegetation on site.	Contractor	Following completion of construction activities in an area
Any vegetation clearing that needs to take place as part of the maintenance activities must be done in an environmentally friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.	Contractor	Operation and maintenance
Where disturbed areas are not to be used during the operation of the proposed power line and on-site substation, these areas must be rehabilitated/re-vegetated with appropriate natural indigenous vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist, as applicable. No exotic plants must be used for rehabilitation purposes.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Proponent in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as areas with steep slopes.	Proponent in consultation with EO and rehabilitation specialist (if required)	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Proponent	Post-rehabilitation
Weeding: It can be anticipated that invasive species and weeds will germinate on rehabilitated soils	Contractor/ Owner	Construction/ Operation

Mitigation: Action/Control	Responsibility	Timeframe
o These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications		
A site rehabilitation programme should be implemented and this will be developed in collaboration with specialists following completion of construction	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

CHAPTER 9: OPERATION MANAGEMENT PROGRAMME

Overall Goal: To ensure that the operation of the PV facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

- Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- Enables the operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
- Minimises impacts on fauna using the site.
- Establishes an environmental baseline for solar energy sites in South Africa.

An environmental manager must be appointed during operation whose duty it will be to ensure the implementation of the operational EMPr.

9.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of environmental management programme during operation

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Operations Manager, and Environmental Manager for the operation phase of this project are detailed below.

The **Operations Manager** will:

- Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
- Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
- Take appropriate action as a result of findings and recommendations in management reviews and audits.
- Provide forums to communicate matters regarding environmental management.

The **Technical/SHEQ Manager** will:

- Develop and Implement an Environmental Management System (EMS) for the solar energy facility and associated infrastructure.
- Manage and report on the facility's environmental performance.
- Maintain a register of all known environmental impacts and manage the monitoring thereof.
- Conduct internal environmental audits and co-ordinate external environmental audits.
- Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.

- » Conduct environmental training and awareness for the employees who operate and maintain PV facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.
- » Track and control the lodging of any complaints regarding environmental matters.

The Technical/SHEQ Manager must provide fourteen (14) days written notification to the DEA that the operation phase will commence.

OBJECTIVE 2: Protection of indigenous natural vegetation, washes, fauna and maintenance of rehabilitation

Indirect impacts on vegetation and terrestrial fauna during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

It may be necessary to routinely trim vegetation growing between the PV panel rows and/or the plant screens planted along the development site fencing. This is to avoid shading of the panels and reduce fire risks. Due to stunted nature of the xerophytic vegetation, it is unlikely that this will need to be done often. Biomass produced from these trimming activities could be chipped and used as mulch under the PV panels (to increase stormwater infiltration and reduce erosion).

Project Component/s	» Rehabilitated areas. » Areas along the perimeter fence. » Areas between PV panels. » Topsoil stockpile areas.
Potential Impact	» Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activities/Risk Sources	» Movement of employee vehicles within and around site
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	O&M Contractor	Operation
Vehicle movements must be restricted to designated access roads	O&M Contractor	Operation
Existing roads and re-aligned access road must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (bags, logs), silt fences, storm water catch-pits, and shade nets).	O&M Contractor	Operation
Develop and implement an appropriate stormwater management plan for the operational phase of the power line and on-site substation	O&M Contractor	Operation
Site access should be controlled and only authorized staff and contractors should be allowed on-site.	O&M Contractor	Operation
Notice boards stating that fauna and flora may not be collected, harvested etc. should be placed at the entrances to the site.	O&M Contractor	Operation
Any maintenance activities should avoid listed plant species and strive to keep the footprint as low as possible.	O&M Contractor	Operation
No herbicides should be used and if vegetation clearing needs to take place, this should be done by hand.	O&M Contractor	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	O&M Contractor	Operation
The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.	O&M Contractor	Operation
A botanist and/or ecologist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis. The monitoring should be undertaken until the rehabilitation is considered adequate and sufficient.	The developer and Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Wetlands, drainage lines, rivers and river riparian areas must be treated as 'no-go' areas in terms of vehicles, machinery, personnel, fuel, oil, bitumen or waste (including waste water).	O&M Contractor	Operation
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.	O&M Contractor	Operation
Spill kits must be kept on-site.	O&M Contractor	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Owner in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Monitor avifaunal movement along the power line and within the solar field, to assess the integrity of mitigation measures in place. Further relevant mitigation measures must be implemented if carcases and/ or injuries are being recorded.	Owner O&M Contractor	Operation
A faunal/ avifauna incident register must be maintained on site.	Owner O&M Contractor SHEQ Manager	Operation
Implement an animal removal plan to ensure safety of workers and fauna.	Owner O&M Contractor	Operation
Regular monitoring for erosion post-construction to ensure that no erosion problems have developed as result of the past disturbance.	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
All declared alien species must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983). There must be an alien species monitoring and eradication program (**Appendix J**) to prevent encroachment of these problem plants for the duration of the operation. The eradication and monitoring program must aim to address alien plant problems within the whole site, not just the development footprint.	O&M Contractor	Operation
A rehabilitation strategy for alien plant species must be implemented for at least two years after construction is completed.	O&M Contractor	Operation
Regular monitoring must be undertaken for alien plant invasion, which is likely to occur in previously disturbed areas or in areas receiving runoff from the hardened surfaces of the infrastructure.	O&M Contractor	Operation
The washing of panels during maintenance must be done with biodegradable soaps to avoid soil contamination and the poisoning of small animals.	O&M Contractor	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager. » Acceptable level of increased siltation in washes, as determined by the site manager. » No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts
Monitoring	» Observation of vegetation on-site by facility manager and environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas. » Inspections of site on a bi-annual basis. » Water management plan.

OBJECTIVE 3: Protection of avifauna from collision and electrocution

During the operation, the threat of collision with the pre-existing 33/132kV Eskom power lines, as well as proposed short overhead distribution power line, is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

Project Component/s	» Power line.
Potential Impact	» Collision and electrocution events with the overhead power line.
Activities/Risk Sources	» Operation of the power line without appropriate mitigation measures.
Mitigation: Target/Objective	» Maintain a low number of collision, and electrocution events.

Mitigation: Action/Control	Responsibility	Timeframe
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.	O&M Contractor	Operation
Periodic inspection of panels to remove and discourage avifaunal nesting is encouraged. Any nests must be removed by a qualified avifaunal specialist.	Avifauna Specialist	Operation

Performance Indicator	» Minimal collision, or electrocution events.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitude for mortalities.

OBJECTIVE 4: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» *Soil degradation including erosion* - by wind and water and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» *Uncontrolled run-off* - relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems.
» *Degradation* - of the natural soil profile due to pollution.

Project Component/s	» Underground cabling. » Ancillary buildings. » Access roads.
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion. » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	O&M Contractor	Operation
Ensure dust control on site through wetting of denuded areas or the use of an appropriate dust suppression measure.	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Sedimentation control measures, such as hay bales, gabions or a layer of rocks sedimentation basins or any silt trap method should be placed at the outlet of the drainage line along the project boundary to trap and contain eroded soil materials from reporting into the main drainage which eventually reports into the Orange River.	O&M Contractor	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	O&M Contractor	Operation
Control depth of excavations and stability of cut faces/sidewalls.	O&M Contractor	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis. » Water management plan developed and implemented.

OBJECTIVE 5: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles), and from the augmentation plant. Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	» Hard engineered surfaces. » On-site vehicles.
Potential Impact	» Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and the augmentation plant.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	O&M Contractor	Operation
Appropriate dust suppression must be applied to the roads as required to minimise/control airborne dust.	O&M Contractor	Operation
Speed of vehicles must be restricted on site, as defined by the Environmental Manager.	O&M Contractor	Operation
Vehicles and equipment must be maintained in a road-worthy condition at all times.	O&M Contractor	Operation

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 6: Ensure the implementation of an appropriate fire management plan during the operation phase

Due to the low extent and presence of the vegetation biomass, site will not require burning to maintain ecological functioning. The fire risks associated with uncontrolled wildfires is therefore considered to be very low. During the wet months, vegetation biomass may increase and thus the fire risk will also increase, yet it will still not be considered high.

The following recommendations below must however be considered with regards to fire protection on site:

» Alien Invasive species should be completely eradicated in order to decrease the fire risk associated with the site. No invasive plants identified at the site, however they may establish to a lesser degree through disturbance of the site .
» Cigarette butts may not be thrown in the veld, but must be disposed of correctly. Designated smoking areas must be established with suitable receptacles for disposal.
» In case of an fire outbreak, contact details of the local fire and emergency services must be readily available.
» Contractors must ensure that basic firefighting equipment is available on site as per the specifications defined by the health and safety representative / consultant.
» The fire risk on site is a point of discussion that must take place as part of the environmental induction training prior to commencement of construction.
» The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection.

The following below can be used as a guide for appropriate fire management:

Project Component/s	» Operation and maintenance of the PV facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the PV plant infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate firefighting equipment on site and establish a fire fighting management plan during operation (**refer to Appendix F**).	Owner O&M Contractor	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Contractor	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Contractor	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Contractor	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Contractor	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Contractor	Operation
Road borders must be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.	O&M Contractor	Operation

Performance Indicator	» Firefighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring	» The project developer must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 7: Minimise the potential impact on farming activities and on the surrounding landowners

Once operational, the impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (i.e. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site and possible increase in criminal activities). The number of workers on site is anticipated to have minimal negative social impacts in this regard.

Employing outsiders on the other hand and accommodating them at the planned accommodation facility on site could also affect the community's social dealings with each other as well as the traditional character of the area. In worst cases it could result in social conflict between the various groupings. The recruitment and employment process would thus have to be sensitively dealt with to limit any possible negative impacts on the daily living patterns of the existing farming community and other community members.

The operations at the facility, however is not anticipated to have severe negative impacts on the neighbouring farmers' living and movement patterns, apart from a limited increase in the movement of people to and from the site, as well as the presence of these employees on-site on a permanent basis. Concerns about rental agreements should be considered.
Vehicle movement to and from the site (e.g. transportation of workers and goods) could influence road users' daily movement patterns, although it is anticipated that this impact would only materialise intermittently.

Project Component/s	» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners. » Impact on farming activities on site.
Potential Impact	» Possible limited intrusion impact on surrounding land owners.
Activities/Risk Sources	» Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents.
Mitigation: Target/Objective	» Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.

Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the facility and accommodation facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	Contractor and Security Contractor	Operation
Vehicle movement to and from the site should be minimised as far as possible.	Contractor and Security Contractor	Operation
Limit the development of new access roads on site as far as possible.	Contractor and Security Contractor	Operation
Infrastructure such as fencing and/or gates along access route must be maintained in the present condition or repaired if disturbed due to project activities	Owner/ O&M Contractor	

Performance Indicator	» No environmental pollution occurs (i.e. waste, water, and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities in surrounding areas.
Monitoring	» The Developer should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.

OBJECTIVE 8: **Appropriate handling and management of hazardous substances, waste and dangerous goods**

The operation of the PV facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and sewage waste.

Project Component/s	» Substation. » PV facility. » Operation and maintenance staff. » Workshop / control room.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	» Substation, transformers, switchgear and supporting equipment. » Workshop / control room.

Mitigation: Target/Objective	» Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, etc.) must be stored in sealed containers within a clearly demarcated designated area.	Owner	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	O&M Contractor	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	O&M Contractor	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	O&M Contractor	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	O&M Contractor	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor, The developer / waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Contractor, waste management contractor	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority » Waste must be stored and handled according to the relevant legislation and regulations	O&M Contractor	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	O&M Contractor	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	O&M Contractor	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Contractor	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.

Monitoring	» Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO. » All appropriate waste disposal certificates accompany the monthly reports.

CHAPTER 10: MANAGEMENT PROGRAMME: DECOMMISSIONING

The PV plant is expected to have a lifespan of 25 - 30 years (i.e. with routine maintenance). The power plant infrastructure would only be decommissioned and rehabilitated once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the PV plant considered in the Basic Assessment process would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section.

» ***Site Preparation***
Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

» ***Disassemble and Remove Infrastructure***
Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

10.1. Objectives

Within a period of at least 12 months prior to the decommissioning of the site a Decommissioning Method Statement must be prepared and submitted to the Local Planning Authority, as well as the Provincial and National Environmental Authority. This method statement must cover site restoration, soil replacement, landscaping, creative conservation, and a timeframe for implementation. Furthermore, this decommissioning must comply with all relevant legal requirements administered by any relevant and competent authority at that time.

The objectives of the decommissioning phase of the proposed project are to:

» Follow a process of decommissioning that is progressive and integrated into the short- and long-term project plans that will assess the closure impacts proactively at regular intervals throughout project life.
» Implement progressive rehabilitation measures, beginning during the construction phase.
» Leave a safe and stable environment for both humans and animals and make their condition sustainable.
» Return rehabilitated land-use to a standard that can be useful to the post-project land user.
» Where applicable, prevent any further soil and surface water contamination by maintaining suitable storm water management systems.
» Maintain and monitor all rehabilitated areas following re-vegetation, and if monitoring shows that the objectives have been met, apply for closure.

10.2. Approach to the Decommissioning Phase

It is recommended that planning of the decommissioning of the project and rehabilitation of the site should take place well in advance (at least two years) of the planned decommissioning activities. Important factors that need to be taken into consideration are detailed below.

Two possible scenarios for this decommissioning phase are detailed below:

SCENARIO 1: TOTAL DECOMMISSIONING OF ENERGY FACILITY.

If the decision is taken at the end of the project lifespan to totally decommission the facility, i.e. make the land available for an alternative land use, the following should take place:

- All concrete and imported foreign material must be removed from the solar facility i.e. panels, support structures etc.
- The holes where the panel support structures are removed must be levelled and covered with subsoil and topsoil
- Tracks that are to be utilised for the future land use operations should be left in-situ. The remainder of the tracks to be removed (ripped) and topsoil replaced;
- All ancillary buildings and access points are to be removed unless they can be used for the future land use
- The underground electric cables are to be removed if they cannot be used in the future land use
- All material (cables, PV Panels etc.) must be re-used or recycled wherever possible. Panels that still produce sufficient output should be considered for donation to rural schools and clinics upon decommissioning
- The competent authority may grant approval to the owner not to remove the landscaping and underground foundations.
  The site must be seeded with locally sourced indigenous vegetation to allow revegetation of site (see plant species list attached).

SCENARIO 2: PARTIAL DECOMMISSIONING OF ENERGY FACILITY.

Should more advanced technology become available it may be decided to continue to use the site as a photovoltaic solar facility. Much of the existing infrastructure is likely to be re-used in the upgraded facility. In this case, all infrastructure that will no longer be required for the upgraded facility must be removed as described for scenario 1. The remainder of the infrastructure should remain in place or upgraded depending on the requirements of the new facility. As described for scenario one above, the PV panels that are still capable of producing sufficient output, could be donated to rural schools and clinics. Any upgrades to the facility at this stage must comply with relevant legislation

10.2.1. Identification of structures for post-closure use

Access roads should be assessed in conjunction with the ultimate land users to determine if these could be used in future. Where not required, these access roads should be decommissioned and rehabilitated.

10.2.2. Removal of infrastructure

All infrastructure must be dismantled and removed. Inert material must be removed from site and disposed of at a suitably registered landfill site. The solar facility components must be removed and recycled where possible or disposed of at a suitably registered landfill site. All foundations must be removed to a depth of 1m. Hard surfaced must be ripped to a depth of 1m and vegetated.

10.2.3. Soil rehabilitation

The steps that should be taken during the rehabilitation of soils are as follows:

- The deposited soils must be ripped to ensure reduced compaction;
- An acceptable seed bed should be produced by surface tillage;
- Restore soil fertility;
- Incorporate the immobile fertilisers in to the plant rooting zone before ripping; and
- Apply maintenance dressing of fertilisers on an annual basis until the soil fertility cycle has been restored.

10.2.4. Establishment of vegetation

The objective is to restore the project site to a self-sustaining cycle, i.e. to realise the re-establishment of the natural nutrient cycle with ecological succession initiated.

The objectives for the re-vegetation of reshaped and top-soiled land are to:

- Prevent erosion;
- Restore the land to the agreed land capability;
- Re-establish eco-system processes to ensure that a sustainable land use can be established without requiring fertilizer additions; and
- Restore the biodiversity of the area as far as possible.

10.2.5. Maintenance

Established vegetation requires regular maintenance. If the growth medium consists of low-fertility soils, then regular maintenance will be required until the natural fertility cycle has been restored.

10.2.6. Monitoring

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the progress of establishment of desired final ecosystems.

The following items should be monitored continuously:
- Erosion status;
- Surface drainage systems and surface water quality;
- Vegetation species diversity; and
- Faunal re-colonisation.

CHAPTER 11: REVISION OF THE EMPR

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. Any amendments must be undertaken as prescribed by the relevant legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time. However, should amendments be required to address an emergency situation these can be implemented immediately.

The EMPr must be updated where the findings of the environmental audit reports indicate insufficient mitigation of the environmental impacts associated with the project, or insufficient levels of compliance with the environmental authorisation or EMPr. The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.

The updated EMPr must be submitted to the Department of Environmental Affairs (DEA) for approval together with the environmental audit report. The updated EMPr must have been subjected to a public participation process which has been agreed to by the DEA, prior to submission of the EMPr to the DEA for approval. Prior to approving the updated (i.e. amended) EMPr the DEA may request specific amendments as it deems appropriate to ensure that the EMPr sufficiently provides for the avoidance, management and mitigation of environmental impacts.

In terms of Regulation 36 (1) of GN R326 of the EIA Regulations, 2014, as amended, where an amendment is required to the impact management actions of the EMPr, such amendments may immediately be effected by the holder of the Environmental Authorisation and reflected in the next environmental audit report submitted as contemplated in the Environmental Authorisation.

APPENDIX A:
LAYOUT AND SENSITIVITY MAP

Skuitdrift 1 Solar PV Energy Faciliy, Northern Cape

Environmental Sensitivity and Layout Map

FARM SKUITDRIFT
RE/426

SCHUITDRIFT SUBSTATION

BLOUPUTS / SCHUITDRIFT 1 132kV OHL

PAULPUTS / SCHUITDRIFT 1 132kV OHL

0 0,075 0,15 0,3 0,45 0,6
Kilometers

Legend

- Existing Substation
- Existing Powerline
- Secondary Gravel Road
- Affected property

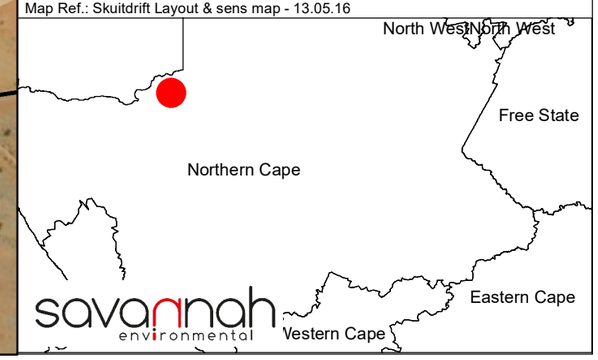
Layout Plan:

- New Power Line
- Road realignment (new road)
- Internal Access Roads
- Main Entrance
- Inverter Station
- Ablution Facility
- Storage Area
- Admin and Security Buildings
- On-site Substation
- PV Array Area

Environmental Sensitivities:

- Heritage Points
- Very High Ecological Sensitivity
- High Ecological Sensitivity
- Medium Ecological Sensitivity

Scale: 1:3 800
Projection: LO19, CGS_WGS_1984
Map Ref.: Skuitdrift Layout & sens map - 13.05.16



savannah environmental

APPENDIX B:
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

PURPOSE

This Grievance Mechanism has been developed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The aim of the grievance mechanism is to ensure that grievances or concerns raised by local landowners and or communities are addressed in a manner that:

- Provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting.
- Builds trust as an integral component of broader community relations activities.
- Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to address grievances in a manner that does not require a potentially costly and time consuming legal process.

PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

- Local landowners, communities and authorities must be informed in writing by the Proponent of the grievance mechanism and the process by which grievances can be brought to the attention of the Proponent through its designated representative.
- A company representative must be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person must be provided to local landowners, communities and authorities.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
- The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.
- The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed).
- Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.
- The meeting should be chaired by the Proponenty representative appointed to address grievances. The Proponent must provide a person to take minutes of and record the meeting/s. Any costs associated with hiring venues must be covered by the Proponent.
- Draft copies of the minutes must be made available to the Complainant and the Proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes

must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.

- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
- In the event that the parties agree to appoint a mediator, the Proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Project Company, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Project Company. The Project Company must provide a person to take minutes of and record the meeting/s.
- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- The draft report must be made available to the Complainant and the Proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action can be or needs to be taken. Closure status will be classified in the Complaints Register as follows:

- Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
- Unresolved. Complaints where it has not been possible to reach an agreed resolution and the case has been authorised for close out by the Appeals Committee.
- Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

The grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the Proponent, either party may be of the opinion that legal action may be the most appropriate option.

APPENDIX C:
EROSION MANAGEMENT PLAN

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this erosion management plan and the revegetation and rehabilitation plan are 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.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

- A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
- An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

2. RELEVANT ASPECTS OF THE SITE

Sections of the development area contained very fine sandy and dispersive soils which in most cases already contained levels of erosion varying between low to moderate. The removal of vegetation and the disturbance of soil will render these areas prone to further erosion or the forming of new erosion areas.

Also prone to erosion are the soils occurring around the washes, however due to the extremely low annual rainfall the risk of water erosion is very low. The condition of the ground for the site as well as broader Scuitdrift areas is such that any surface water is very quickly absorbed into the soil, as such this substantiates that water build up on the surface is minimal to none and practically eliminates any water flow which might cause water erosion.

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the site should be to:

» Protect the land surface from erosion;
» Intercept and safely direct run-off water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
» Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

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 summer thunder storms can also cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.

- Soils loss will be greater on steeper slopes. Ensure that steep slopes are not devegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.

» Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.

» The extent of disturbance will influence the risk and consequences of erosion. Therefore site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.

» Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.

» Where necessary, new roads constructed should include water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.

» Roads and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.

» Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.

» All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.

» Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.

» Gabions and other stabilisation features should be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.

» Activity at the site after large rainfall events when the soils are wet and erosion risk is increased should be reduced.

» Topsoil should be removed and stored separately during construction activities (as per the recommendations in the EMPr), and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.

» Regular monitoring of the site for erosion problems during construction (ongoing) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The ECO will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

3.1.1. Erosion control mechanisms

The contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

- Reno mattresses
- Slope attenuation
- Hessian material
- Shade catch nets

- Gabion baskets
- Silt fences
- Storm water channels and catch pits
- Soil bindings
- Geofabrics
- Hydro-seeding and/or re-vegetating
- Mulching over cleared areas
- Boulders and size varied rocks
- Tilling

3.2. Engineering Specifications

A detailed engineering specifications Storm-water Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of the Storm-water Management Plan (Appendix G of the EMPr) and this should include erosion control measures. Requirements for project design include:

- Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
- All temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
- An onsite Engineer or Environmental Officer (EO) to be responsible for ensuring implementation of the erosion control measures on site during the construction period. The ECO to monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved Storm-Water Plan is not correctly or appropriately implemented and damage to the environment is caused.

3.3. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on site the Environmental Officer (during construction) or Environmental Manager (during operation) must:

» Assess the significance of the situation.
» Take photographs of the soil degradation.
» Determine the cause of the soil erosion.
» Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
» Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
» Report and monitor the progress of the rehabilitation weekly and record all the findings in a site register (during construction).
» All actions with regards to the incidents must be reported on a monthly compliance report which will be submitted to the Competent Authority (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g. an engineer) must:

- Select a system/mechanism to treat the erosion.
- Design and implement the appropriate system/mechanism
- Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
- Continue monitoring until the area has been stabilised.

4. CONCLUSION

The Erosion Management Plan is a document to assist the Proponent/ EPC Contractor with guidelines on how to manage erosion during all phases of the project. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project (if and where applicable).

5. REFERENCES

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APPENDIX D:
WASTE MANAGEMENT PLAN

WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management. This purpose of this plan is to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste that is generated from the activities on site. The plan prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste.

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and includes waste stream information available at the time of compilation. Construction practices and operations must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be further updated should further detail regarding waste quantities and categorisation become available, during the construction and/or operational stages.

2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of the Skuitdrift 1 Solar PV Energy Facility will generate construction solid waste, general waste, contaminated water and soil.

Waste generated on site, originates from various sources including:

- Concrete waste generated from removal and demolition of the batching plant, dummy columns, plinths, temporary bunds and foundations, spoilt and excess concrete.
- Contaminated water, soil and vegetation due to hydrocarbon spills.
- Hydrocarbon waste from vehicle, equipment and machinery parts (oil cans, filters, rags etc), and servicing.
- Hazardous/ non-hazardous chemical waste from, chemical dosing in the WTP/WWTP, cleaning of steam/ heat storage vessels and pipework, flouresent tubes and waste ink carteridges.
- Recycable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE), cardboard and rockwool.Organic waste from food waste and alien vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from excess rock and soil from site clearence and trenching works.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by means of a number of pieces of legislation, including:

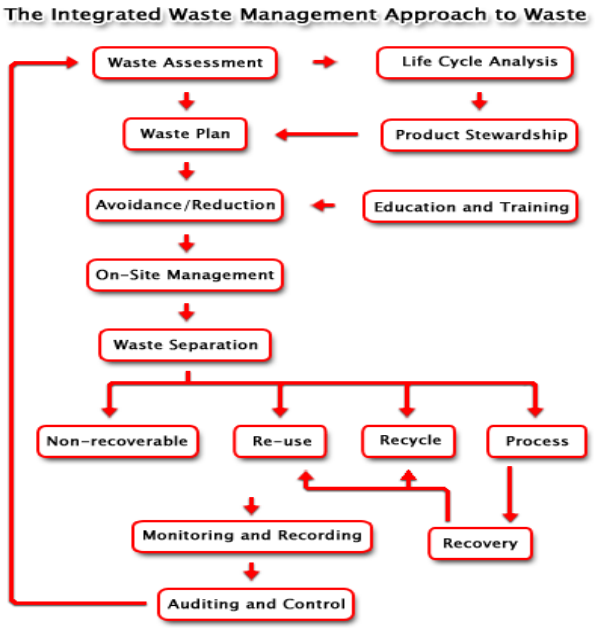
- National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008)
- National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)
- The South African Constitution (Act 108 of 1996)
- Hazardous Substances Act (Act 5 of 1973)
- Health Act (Act 63 of 1977)
- Environment Conservation Act (Act 73 of 1989)
- Occupational Health and Safety Act (Act 85 of 1993)
- National Water Act (Act 36 of 1998)
- The National Environmental Management Act (Act 107 of 1998)
- Municipal Structures Act (Act 117 of 1998)

- Municipal Systems Act (Act 32 of 2000)
- Mineral and Petroleum Resources Development Act (Act 28 of 2002)
- Air Quality Act (Act 39 of 2004)

Storage of waste must be undertaken in accordance with the National Norms and Standards for the Storage of Waste published in GN926.

4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management on site is needed. Such an approach is illustrated in the figure below.



Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

- Reducing volumes of waste is a priority;
- If reduction is not feasible, the maximum amount of waste is to be recycled; and
- Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner as possible.

4.1. Construction phase

A plan for the management of waste during construction waste is detailed below. As previously stated, construction practices must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction.

4.1.1. Waste Assessment / Inventory

- The Environmental Officer must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
- Once a waste inventory has been established, targets for recovery of waste (minimisation, re-use, recycling) should be set.
- The Environmental Officer must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

4.1.2. Waste collection, handling and storage

- Each subcontractor must implement their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc.
- Septic tanks and portable toilets must be monitored and maintained daily. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the area.
- Waste collection bins and hazardous waste containers must be provided by the principal contractor and placed at various areas around site for the storage of organic, recyclable and hazardous waste.
- A dedicated waste area must be established on site for the storage of all waste streams, before removal from site.
- Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- Hazardous waste must be stored within a bunded area constructed according to SABS requirements. The volume of waste stored in the bunds must not exceed 110% of the bund capacity.
- The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- A dedicated waste management team must be appointed by the principal contractors' EO, whom will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the EO.
- All waste removed from site must be done so by a registered/ licensed subcontractor, whom must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month.

4.1.3. Management of waste storage areas

- The position of all waste storage areas must be located away from water courses and ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and dirty storm water.
- Collection bins placed around site and at subcontractors' camps must be maintained and emptied on a regular basis by the principal contractor.
- Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked or colour coded and well-maintained, not allowing access

to vermin or other rodents. Shade cloth should ideally be used to ensure avifauna does not have access to waste.
» Waste must be stored in designated containers and not on the ground.
» Inspections and maintenance of bunds must be undertaken daily. Bunds must be inspected for leaks or cracks in the foundation and walls.
» It is assumed that any rainwater collected inside the bund is contaminated and must be removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

4.1.4. Disposal

» Waste generated on site must be removed on a regular basis, as determined by the Environmental Officer. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.
» Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor.

4.1.5. Record keeping

The success of the waste management plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

» Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
» Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions

5. Operational phase

It is expected that the operational phase will result in the production of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Limited hazardous wastes (grease, oils) may also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site.

The following waste management principles apply during the operational phase:

» The Environmental Manager must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
» Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.

- Recyclable waste must be removed from the waste stream and stored separately.
- All waste must be stored in appropriate temporary storage containers (separated between different construction wastes, and contaminated or wet waste) at each construction area prior to being taken to the construction camp for final sorting (if required) and further temporary storage. Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
- Waste generated on site must be removed on a regular basis throughout the operational phase.
- Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor.

6. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly.

APPENDIX E:
STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN

1. PURPOSE

It is widely recognised that developments impact negatively on drainage systems. By taking greater cognisance of natural hydrological patterns and processes it is possible to develop stormwater management systems in manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate stormwater management are increased erosion risk and risks associated with flooding. Therefore, this stormwater management plan and the erosion management plan are closely linked to one another and be managed together.

This Stormwater Management Plan addresses the management of stormwater runoff from the development site and significant impacts relating to resultant impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of storm water management measures and infrastructure are:

- Annual average rainfall;
- Rainfall intensities;
- Soil and vegetation cover;
- Topography and slope gradients; and
- Placing of infrastructure and infrastructure design.

The objective of the plan is to provide measures to address runoff from disturbed portions of the site, such that they:

- do not result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
- do not result in any necessity for concrete or other lining of natural watercourses to protect them from concentrated flows off the development.
- do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

This storm water management plan must be updated and refined once the construction/ civil engineering plans have been finalised.

2. RELEVANT ASPECTS OF THE SITE

The 'Washes' are defined in terms of the current study as those areas which show visible signs of occasional water movement and sediment transport, but which do not receive sufficient runoff to develop characteristic soils or vegetation associated with wetlands or drainage lines.

It is important to understand the dynamic nature of the washes; they are not heavily incised and due to the homogenous slope and substrate of the site, they are fairly dynamic in nature and frequently move back and forth across the slope over time as active channels become vegetated or filled with sediment. In terms of mitigation, in order to maintain the natural pattern of water movement across the site, diversion structures should be present along the roads the divert flow off of the roads.

Although development within the washes themselves should be avoided, a large buffer is not deemed necessary in the current context. The appropriate buffer around these areas is to some extent dependent on the manner in which the PV panel support structures will be constructed. Any vegetation disturbance and clearing during construction over the washes would be acceptable provided that care is taken to ensure that the washes themselves are not obstructed. For this reason, a 5 - 10m buffer is proposed for the construction of the PV panels.

3. STORMWATER MANAGEMENT PRINCIPLES

In the design phase, various stormwater management principles should be considered including:

- Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
- Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
- Minimse the area of exposure of bare soils to minimse the erosive forces of wind, water and all forms of traffic.
- Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
- Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
- Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.
- Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
- Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
- Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the major stormwater system should be taken, with the provision of detention storage facilities at suitable points.
- To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a 2-3% 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.
- Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert.
- Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
- Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by stormwater must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or revegetation of the area. Any inlet to a piped system should be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system.
- Preferably all drainage channels on site and contained within the larger area of the property (i.e. including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

3.1. Engineering Specifications

A detailed Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase. This should include erosion control measures. Requirements for project design include:

- Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
- The location, area/extent (m^2/ha) and specifications of all temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
- The drainage system for the site should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying storm waters around and away from infrastructure.
- Procedures for storm water flow through a project site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
- An onsite Engineer or Environmental Officer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- The Developer holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

During the construction phase, the contractor must prepare a Stormwater Control Method Statement to ensure that all construction methods adopted on site do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of the Stormwater Management Plan are met before, during and after construction. The designated responsible person on site, as indicated in the Stormwater Control Method Statement shall ensure that no construction work takes place before the stormwater control measures are in place.

An operational phase stormwater management plan should be designed and implemented, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

APPENDIX F:
EMERGENCY FIRE MANAGEMENT PLAN

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

- To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective response to possible events.
- To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas;
- To facilitate emergency response and to provide such assistance on the site as is appropriate to the occasion;
- To ensure communication of all vital information as soon as possible;
- To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed;
- To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of construction detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC PS1 and include the following:

- Identification of areas where accidents and emergency situations may occur;
- Communities and individuals that may be impacted;
- Response procedure;
- Provisions of equipment and resources;
- Designation of responsibilities;
- Communication; and
- Periodic training to ensure effective response to potentially affected communities.

2. PROJECT-SPECIFIC DETAILS

Scuitdrift Solar Project (Pty) Ltd intends to develop a photovoltaic solar facility on the Farm Scuitdrif 426, near Augrabies, Northern Cape Province. The development is to be referred to as the Skuitdrift 1 Solar PV Energy Facility. Due to the scale and nature of this development, it is anticipated that the following risks could potentially arises during the construction and operational phases:

- Fires;
- Leakage of hazardous substances;
- Storage of flammable materials and substances;
- Flood events and overflow of wastewater retention dam;
- Accidents; and
- Natural disasters.

3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

- Local Emergency: An alert confined to a specific locality.
- Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
- Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there is any doubt as the whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur; for a gas fire it is usually appropriate to isolate the fuel and let it burn itself out but keep everything around the fire cold.

3.1. Emergency Scenario Contingency Planning

3.1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

i. Spill Prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

- All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed designated areas.
- All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
- No refuelling, storage, servicing, or maintenance of equipment should take place within 50m of drainage lines or sensitive environmental resources in order to reduce the risk of contamination by spills.
- No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
- Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
- If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not

pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.

» Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

ii. Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment.
3. Stop the spill if safely possible.
4. Contain spill to limit entering water bodies and surrounding areas.
5. Identify substance spilled.
6. Quantify spill (under or over guideline/threshold levels).
7. Notify Site Manager and emergency response crew and authorities (in event of major spill).
8. Inform users (and downstream users) of potential risk.
9. Clean up of spill using spill kit or by HazMat team.
10. Record of spill incident on company database.

a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies. The following methods could be used:

» *Dykes*
Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.

» *Trenches*
Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of trench required. Spilled substances can then be recovered using a pump or sorbent materials.

Containment of Spills on Water

Spills in water can negatively impact water quality and aquatic life. All measures need to be undertaken to contain spills on open water. The following methods could be used:

» *Weirs*
Weirs can be used to contain spills in streams and to prevent further migration downstream. Plywood or other materials found on site can be placed into and across the width of the stream, such that water can still flow under the weir. Weirs are however only effective for spilled substances which float on the water surface.

» *Barriers*
In some situations barriers made of netting or fence material can be installed across a stream, and sorbent materials placed at the base to absorb spilled substance. Sorbents will need to be replaced as soon as they are saturated. Water will be allowed to flow through.

b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated, or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedures for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

3.1.2. Scenario: Fire (and fire water handling)

i. Action Plan

The following action plan is proposed in the event of a fire:

1. Quantify risk
2. Assess person safety, safety of others and environment
3. If safe – attempt to extinguish fire using appropriate equipment
4. If not safe to extinguish, contain fire
5. Notify Site Manager and emergency response crew and authorities

6. Inform users (and downstream users) of potential risk of fire
7. Record of incident on company database

ii. Procedures

Because large scale fires may spread very fast in the environment it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguisher, hose reels, hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and National standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

a) Procedures for initial actions

Persons should not fight the fire if any of the following conditions exist:

» They have not been trained or instructed in use of a fire extinguisher.
» They do not know what is burning.
» The fire is spreading rapidly.
» They do not have the proper equipment.
» They cannot do so without a means of escape.
» They may inhale toxic smoke.

b) Reporting procedures

» Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
» The site manager must have copies of the Report form to be completed.

3.1.3. Scenario: Flood events and overflow of wastewater retention dam

i. Action Plan

The following action plan is proposed in the event of a flood of overflow of wastewater retention dam:

1. Identify flood state or overflow
2. Assess personal safety, safety of others and environment
3. Identify source
4. Stop the source of water(waste) causing overflow if safely possible
5. Contain overflow water to limit it entering surrounding water bodies
6. Quantify overflow

7. Notify Site Manager and emergency response crew and authorities
8. Inform users (and downstream users) of potential risk
9. Record of incident on company database

ii. Flood/overflow Effect Prevention Measures

Preventing flood/ overflowing of wastewater retention dam must be a top priority. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the Environmental Manager. All parties are expected to:

» Always conduct proper maintenance and inspections on the area and machinery/vehicles.
» Never allow for the risk of over flowing, especially in or near sensitive areas.
» Know the limits of the wastewater dam/s.
» Store all materials in protected areas.

Restrictions must be placed on amounts of wastewater to be pumped into the dam. All technical detail as to capacity and limitations of the facility must be made extremely clear to reduce the potential of contamination.

iii. Procedures

Although attempts can be made to minimise the effects of flooding, it is impossible to prevent floods altogether. Being prepared for flooding and having emergency plans must therefore be a priority.

a) Procedures for initial actions

» Ensure safety of all personnel.
» Assess hazards and risks.
» Stop the flood/overflow if safely and physically possible, e.g. shut off pump.
» No matter what the volume is, notify site manager.
» Contain the wastewater.

b) Reporting procedures

» Report immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
» The site manager, will have copies of the Report form to be completed.

c) Procedures for containing and controlling overflow of wastewater retention dam

Measures can be taken to prepare for quick and effective containment of any potential overflow.

» Initiate overflow containment by first determining what will be affected by the incident.
» Assess speed and direction of overflow and cause of movement (water, wind and slope).
» Determine best location for containing wastewater, avoiding any water bodies.
» Have a contingency plan ready in case event worsens beyond control or if the weather or topography impedes containment.

d) Procedures for transferring, storing, and management.

Following clean up, any tools or equipment used will be properly washed and decontaminated, or replaced if this is not possible. All materials used for containment of spilled wastewater must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

SUMMARY: RESPONSE PROCEDURE

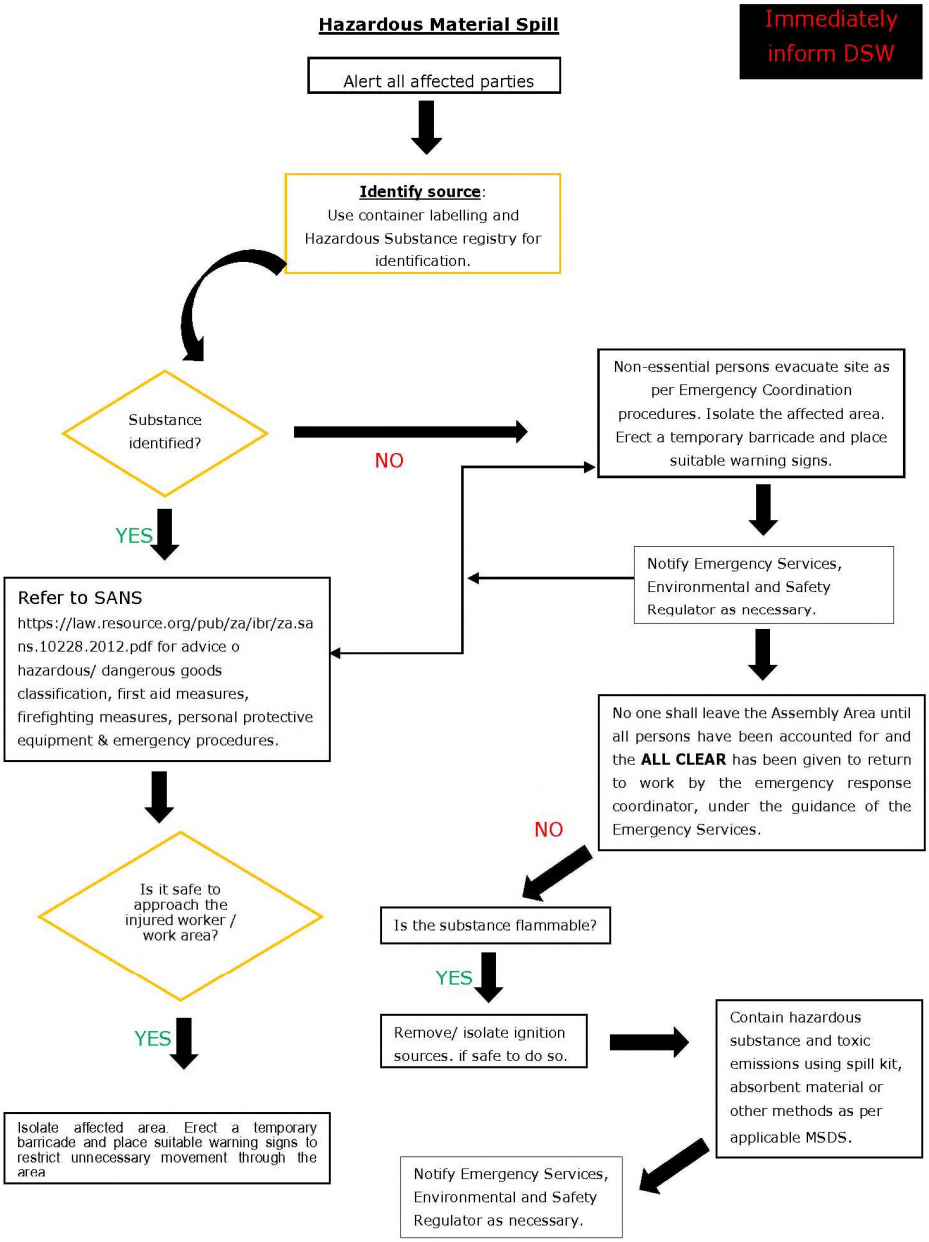


Figure 1: Hazardous Material Spill

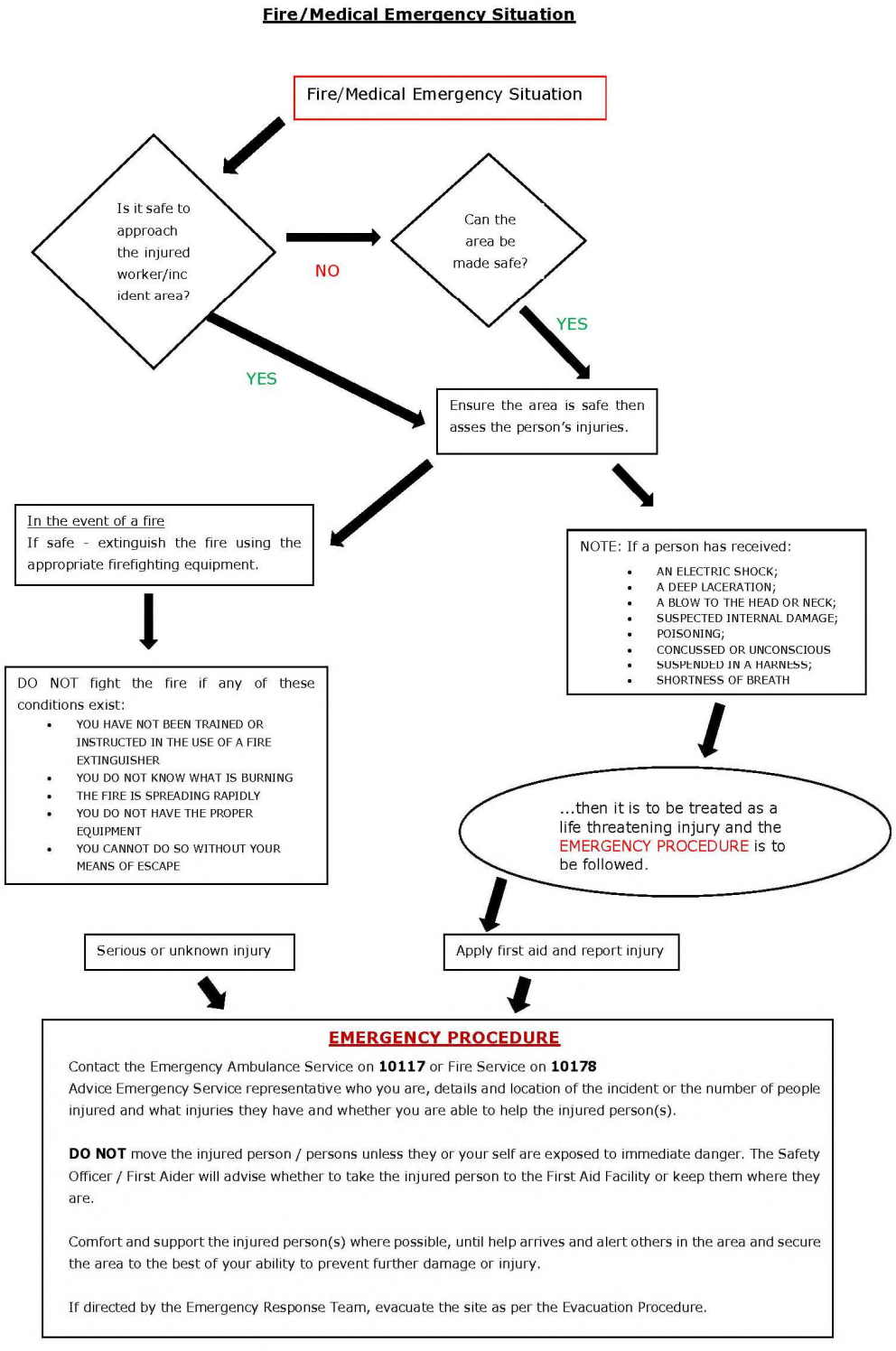


Figure 2: Emergency Fire/Medical

APPENDIX G:
TRAFFIC MANAGEMENT PLAN

PRINCIPLES FOR TRAFFIC MANAGEMENT

1. PURPOSE

The purpose of this Traffic Management Plan (TMP) is to address regulatory compliance, traffic management practices, and protection measures to help reduce impacts related to transportation and the construction of temporary and long-term access within the vicinity of the Skuitdrift 1 Solar PV Energy Facility. The objectives of this plan include the following:

- To ensure compliance with all legislation regulating traffic and transportation within South Africa (National, Provincial, Local & associated guidelines).
- To avoid incidents and accidents while vehicles are being driven and while transporting personnel, materials, and equipment to and from the project site.
- To raise greater safety awareness in each driver and to ensure the compliance of all safe driving provisions for all the vehicles.
- To raise awareness to ensure drivers respect and follow traffic regulations.
- To avoid the deterioration of access roads and the pollution that can be created due to noise and emissions produced by equipment, machinery, and vehicles.

2. RELEVANT ASPECTS OF THE PROJECT

The N14 national road is located approximately 30km North West of the proposed development site. Transport to the site will be along appropriate national, provincial and local roads. The access roads to the site will be from Pofadder or Augrabies via Kakamas, along the N14. This is a tarred national road and no alterations should be necessary to handle construction traffic and traffic involved in the operation phase. The access road to the Skuitdrift 1 Solar PV Energy Facility from the N14 has been confirmed as two divisional roads, the R359 and DR3256 which fall under the ZF Mgcawu District Municipality. Access/haul roads to the site as well as internal access roads within the site are required to be established. The internal access roads will be up to 4 m in width. As far as possible, existing access roads to the site would be utilised, and upgraded where required.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

- Prior to the commencement of construction the contractor must develop their own detailed Transport Management Plan (TMP) based on the requirements laid out in this plan.
- The transport contractor must ensure that all required permits for the transportation of abnormal loads are in place prior to the transportation of equipment and project components to the site. Specific abnormal load routes must be developed with environmental factors taken into consideration.
- Before construction commences, authorised access routes must be clearly marked in the field with signs or flagging. The Construction Contractor must review the location of designated access and will be responsible for ensuring construction travel is limited to designated routes. The entrance of the main access road must not be constructed before a blind rise or on a bend of the public road.
- All employees must attend an environmental training program (e.g. toolbox talks) by the Environmental Officer (EO). Through this program, employees will be instructed to use only approved access roads, drive within the delineated road limits, and obey jurisdictional and posted speed limits to minimise potential impacts to the environment and other road users.

- The contractor will be responsible for making sure that their suppliers, vendors, and subcontractors strictly comply with the principles of this TMP and the contractor's TMP.
- Adjacent landowners must be notified of the construction schedule.
- Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.
- Signs must be posted in the project area to notify landowners and others of the construction activity.
- Flagging must be provided at access points to the site and must be maintained until construction is completed on the site.
- Speed limits must be established prior to commencement of construction and enforced over all construction traffic.
- Speed controls and implementation of appropriate dust suppression measures must be enforced to minimise dust pollution.
- Throughout construction the contractor will be responsible for monitoring the condition of roads used by project traffic and for ensuring that roads are maintained in a condition that is comparable to the condition they were in before the construction began.
- Drivers must have an appropriate valid driver's license and other operation licences required by applicable legislation.
- All vehicles must be maintained in good mechanical, electrical, and electronic condition, including but not limited to the brake systems, steering, tires, windshield wipers, side mirrors and rear view mirror, safety belts, signal indicators, and lenses.
- Any traffic delays attributable to construction traffic must be co-ordinated with the appropriate authorities.
- No deviation from approved transportation routes must be allowed, unless roads are closed for reasons outside the control of the contractor.
- Impacts on local communities must be minimised. Consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.

4. MONITORING

- The principal contractor must ensure that all vehicles adhere to the speed limits.
- A speeding register must be kept with details of the offending driver.
- Repeat offenders must be penalised.
- Where traffic signs are not being adhered to, engineering structures must be used to ensure speeds are reduced.

APPENDIX H:
PLANT RESCUE AND PROTECTION PLAN

PLANT RESCUE AND PROTECTION PLAN

1. PURPOSE

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures, in addition to the mitigations included in the Environmental Management Programme (EMPr) to reduce the impact of the development of the Skuitdrift 1 Solar PV Energy Facility on listed and protected plant species and their habitats and to provide guidance on search and rescue of species of conservation concern.

2. RELEVANT ASPECTS OF THE SITE

According to the national vegetation map (Mucina & Rutherford 2006), the site lies within the Blouputs Karroid Thornveld vegetation type. Blouputs Karroid Thornveld occurs as a belt of irregular flat areas from the vicinity of Augrabies Falls in the east to Kotie se Laagte and Samoep se Laagte in the west. The vegetation type is listed as Least Threatened and less than 1% has been transformed. It is well conserved (27%) within Augrabies Falls National Park. At 607 km^2 it is however the smallest mapped vegetation unit within the Nama Karoo Biome. Other vegetation types which occur in the vicinity of the site include Lower Gariep Broken Veld, Bushmanland Arid Grassland and along the banks of the Orange River, Lower Gariep Alluvial Vegetation. Lower Gariep Broken Veld and Bushmanland Arid Grassland are also classified as Least Threatened and have been little impacted by transformation. The lower Gariep Alluvial Vegetation is however classified as Endangered on account of the high degree of transformation it has experienced. This vegetation is however restricted to the banks of the Orange River and would not be affected by the development.

Several different habitats and plant communities were evident at the site, including plant communities associated with rocky plains, sandy plains, drainage lines and rocky outcrops. Within the area earmarked for development, the vegetation was however homogenous and apart from several small washes, there was little differentiation of the vegetation. Consequently, only two communities are recognized, that of the washes and that of the adjacent plains. The plains within the development area are generally open with occasional scattered trees of *Acacia erioloba*, *Acacia mellifera* and *Boscia foetida*. The plains are dominated by the grasses *Stipagrostis uniplumis*, *S.ciliata* and *Schmidtia kalahariensis* with occasional shrubs such as *Rhigozum trichotomum*, *Phaeoptilum spinosum* and *Salsola rabieana*.

According to the SANBI SIBIS database, only one endangered species *Caesalpinia bracteata* is known from the area, and is classified as Vulnerable. This species has a highly restricted distribution and is known from a total population of about 1000 adult plants (Threatened Species Programme, Red List of South African Plants (2011), but as it occurs on rocky outcrops, it would not occur within the proposed development area and was not observed. A number of protected species were observed at the site including *Hoodia gordonii*, *Aloe dichotoma* and *Acacia erioloba*. Within the proposed development area only *Acacia erioloba* was observed. Four individuals of *Acacia erioloba* were within the proposed development area and an additional two in close proximity to the development.

A permit would be required for the destruction of the trees within the development footprint. No succulent or geophytes species suitable for search and rescue operations were observed within the development footprint and this is not seen as a viable option for any of the species present. Species for which this would

be viable such as *Hoodia gordonii* and *Aloe dichotoma* were observed at the site, but did not occur within the development footprint.

3. PRINCIPLES FOR SEARCH AND RESCUE

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

The following principles apply in terms of plant rescue and protection:

- A permit is required from the Northern Cape Department of Economic Development and Nature Conservation (DENC) to translocate or destroy any listed and protected species identified by the ecological walkthrough survey undertaken for the optimised final Skuitdrift 1 Solar PV Energy Facility, even if they do not leave the property. This permit should be obtained prior to any search and rescue operations being undertaken.
- Where suitable species are identified, a search and rescue operation of these species should be undertaken within the development footprint, where these species would be affected, and prior to the commencement of construction.
- As far as possible, timing of search and rescue activities should be planned with the onset of the growing season.
- Affected individuals should be translocated to a similar habitat outside of the development footprint and marked and recorded for monitoring purposes. For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device.
- The rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat.
- Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. Re-planting into the wild must cause as little disturbance as possible to existing natural ecosystems. The position of he rescued individual/s must be recorded to aid in future monitoring of that plant as noted earlier.
- During construction, the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO/ Environmental Representative must monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO/ Environmental Representative or Environmental Officer and any listed species present which are able to survive translocation should be translocated to a safe site.
- Any listed species suitable for translocation observed within the development footprint, and that would be affected, that were not previously observed be translocated to a safe site.

- The collecting of plants of their parts should be strictly forbidden (as per the mitigations included in the EMPr). Staff should be informed of the legal and conservation aspects of harvesting plants from the wild as part of the environmental induction training as per the mitigations including the EMPr).
- Sensitive habitats and area outside project development should be clearly demarcated as no go areas during the construction and operational phase to avoid accidental impacts.

APPENDIX I:
REVEGETATION AND REHABILITATION PLAN

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the Skuitdrift 1 Solar PV Energy 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 of the rehabilitation plan for the site can be summarised 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.
- Ensure that disturbed areas are safe for future uses.

This Revegetation and Rehabilitation Plan should be closely aligned with other site-specific plans, including the Erosion Management Plan, Soil Management Plan, Alien Plant Management Plan, and Plant Rescue and Protection Plan. Prior to commencement of construction, a detailed Rehabilitation Plan and Method Statement for the site should be compiled with the aid of a Rehabilitation Specialist.

2. RELEVANT ASPECTS OF THE SITE

According to the national vegetation map (Mucina & Rutherford 2006), the site lies within the Blouputs Karroid Thornveld vegetation type. Blouputs Karroid Thornveld occurs as a belt of irregular flat areas from the vicinity of Augrabies Falls in the east to Kotie se Laagte and Samoep se Laagte in the west. The vegetation type is listed as Least Threatened and less than 1% has been transformed. It is well conserved (27%) within Augrabies Falls National Park. At 607 km^2 it is however the smallest mapped vegetation unit within the Nama Karoo Biome. Other vegetation types which occur in the vicinity of the site include Lower Gariep Broken Veld, Bushmanland Arid Grassland and along the banks of the Orange River, Lower Gariep Alluvial Vegetation. Lower Gariep Broken Veld and Bushmanland Arid Grassland are also classified as Least Threatened and have been little impacted by transformation. The lower Gariep Alluvial Vegetation is however classified as Endangered on account of the high degree of transformation it has experienced. This vegetation is however restricted to the banks of the Orange River and would not be affected by the development.

Rehabilitation and revegetation of cleared ground in arid areas can be very difficult and slow. Therefore, it is recommended that only essential vegetation clearing should take place. If the foundations of the panel mounting structures can be constructed without wholesale vegetation clearing, then this would significantly reduce the erosion and alien plant invasion risks associated with the development, with long-term benefits for the maintenance requirements of the facility. Woody plants that need to be cleared could be removed individually by cutting them off at ground level with a chainsaw or if heavy machinery is available, they can be pulled directly from the soil using chains. This would possibly include some individuals of protected tree species such as *Acacia erioloba*, and a permit for the destruction of such species would be required.

3. Recommended plant species to use for rehabilitation

The following plant species are recommended for rehabilitation:
(Species highlighted in blue are the preferred species to be used during the initial revegetation and species in green for the final phase.)

- Rescued plants and bulbs
- *Ehrharta calycina,*
- *Merxmuellera stricta*
- *Karroochloa purpurea*
- *Pentaschistis eriostoma*
- *Stipagrostis ciliata*
- *Stipgrostis namaquensis* (along drainage lines and dry stream crossings)
- *Enneapogon scaber* (within disturbed rockeries and beds)
- Annual and Pioneer herbs:
  - Seeds can be collected from various annual herb species occurring naturally within the area, especially spreading and mat forming species.
  - *Heliophila cornuta*
  - *Heliophila crithmifolia*
  - *Hemimeris centrodes*
  - *Diascia parviflora* (along drainage lines and shaded areas)
  - *Nemesia karroensis*
  - *Cotula microglossa* (along drainage lines)
  - *Lasiospermum brachyglossum, Lasiospermum pedunculare*
  - *Ursinia pilifera*
  - *Arctotis fastuosa* (along drainage lines)
  - Various *Gazania* species including *G. heterochaeta, G. krebsiana, G. othonnites* etc.
- Shrubs
  - *Pelargonium agrotanifolium, Pelargonium crithmifolium*
  - *Oedera genistifolia*
  - *Euryops multifidus*
  - *Dimorphotheca cuneata*
  - *Decerothamnus rhinocerotis*
  - *Rosenia oppositifolia*
  - *Eriochepahlus africanus, Eriocephalus punctulatus, Eriocephalus microphylus* (within and around disturbed rockeries and beds)
  - *Pteronia glomerata, Pteronia incana, Pteronia pallens*
  - *Chrysocoma ciliata*
- Succulents
  - Most of the occurring species can be removed and transplanted afterwards to stabilize the soil. There seeds can also be collected and cultivated species can be used.
  - These species include:
    - Ruschia cradockensis, Ruschia centrocapsula, Rhuschia spp. (R. pungens)
    - Antimima pumila
    - Cheiridopsis namaquensis
  - Other species found in the surrounding area that can also be affectively used are:
    - Cephalophyllum framesii
    - Drosanthemum eburneum, Drosanthemum lique

- Mesembryantemum guerichianum (Annual)
- Mesembryantemum nodiflorum (Annual)

4. REHABILITATION METHODS

» Immediately after replacing topsoils in disturbed areas, the soil surface must be revegetated with a suitable plant cover.
» It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover. However, simply applying this topsoil to a well prepared rehabilitation site does not result in the same species richness and diversity as the surrounding areas. In some areas the natural regeneration of the vegetation may be poor and the application relevant of seed to enhance vegetation recovery may be required.
» Where possible, seed should be collected from plants present at the site during plant rescue oprerations. Indigenous seeds may also 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 collection should be undertaken by a suitably qualified specialist who is familiar with the various seed types associated with the plant species and rehabilitation in the area.
» Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. The collection of unripe seeds will reduce the percentage germination thereby reducing the effectiveness of the rehabilitation efforts. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.
» Seed can be sown 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. Additional organic material may be added to the soil mix, if required, to assist with water retention during the early stages of seedling establishment.
» It should be ensured that the seed mix is as diverse as possible in the first season. After the first season, when pioneer plant communities have successfully established, attempts should be made to re-sow and replant the area with more perennial and woody species. It is a process that will require several follow-ups.
» Planting is dependent on species involved. Planting of species recommended for rehabilitation should be carried out as far as is practicable to coincide with the onset of the first significant rains. In general however, planting should commence as soon as possible after construction is completed in order to minimise the potential for erosion.
» The final vegetation cover should resemble the original (non-encroached and indigenous) vegetation composition and structure as far as practicably possible.
» Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed.
» 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, this must be undertaken in consultation with the landowner.
» 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.

5. MONITORING AND FOLLOW-UP ACTION

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of rehabilitated areas. During the construction phase, the Environmental Officer (EO) and EPC Contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the Proponent will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state.
- Associated nature and stability of surface soils
- Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately.

The initial revegetation period post construction is estimated to be over a period of 6 months (minimum) to 12 months (maximum), or a time period specified by the rehabilitation specialist, particularly if planting of trees and shrubs occurs. The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).

As rehabilitation success, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

- 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 20% 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.

If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until an acceptable plant cover is achieved (excluding alien plant species or weeds). Additional seeding or planting may be necessary to achieve acceptable plant cover. Hand seeding may have to be considered as an option in this case.

Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging alien plant species should continue for as long as considered necessary.

APPENDIX J:
ALIEN INVASIVE MANAGEMENT PLAN

ALIEN PLANT MANAGEMENT PLAN

1. PURPOSE

Invasive alien species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this 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 Skuitdrift 1 Solar PV 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.
- Develop and implement a monitoring and eradication programme for alien and invasive species.
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

2. RELEVANT ASPECTS OF THE SITE

According to the national vegetation map (Mucina & Rutherford 2006), the site lies within the Blouputs Karroid Thornveld vegetation type. Blouputs Karroid Thornveld occurs as a belt of irregular flat areas from the vicinity of Augrabies Falls in the east to Kotie se Laagte and Samoep se Laagte in the west. The vegetation type is listed as Least Threatened and less than 1% has been transformed. It is well conserved (27%) within Augrabies Falls National Park. At 607 km^2 it is however the smallest mapped vegetation unit within the Nama Karoo Biome. Other vegetation types which occur in the vicinity of the site include Lower Gariep Broken Veld, Bushmanland Arid Grassland and along the banks of the Orange River, Lower Gariep Alluvial Vegetation. Lower Gariep Broken Veld and Bushmanland Arid Grassland are also classified as Least Threatened and have been little impacted by transformation. The lower Gariep Alluvial Vegetation is however classified as Endangered on account of the high degree of transformation it has experienced. This vegetation is however restricted to the banks of the Orange River and would not be affected by the development.

Very few alien species were observed at the site which can be ascribed to the arid nature of the area combined with nutrient-poor soils. As a result, the risk of alien plant invasion should be relatively low. Alien plants are however likely to become an issue if the site is highly disturbed during construction or if water runoff is not properly managed.

3. LEGISLATIVE CONTEXT

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared aliens must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act, 198 alien species were listed as declared weeds and invaders and ascribed to one of the following categories:

- Category 1: Prohibited and must be controlled.
- Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.

» Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEMBA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

» Category 1a: Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
» Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
» Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.
» Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

Plants listed under the categories above are detailed within Notice 1 of the Alien and Invasive Species published in GNR599 of 01 August 2014. 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.

It is important to note that alien species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM:BA.

4. ALIEN PLANT MANAGEMENT PRINCIPLES

4.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species shortly after they establish in the project area. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When new Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide should be planned.

It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

4.2. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

4.3. 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. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. Clearing Methods

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however 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 shall 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/.

» **Mechanical control**
This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive, and could cause severe soil disturbance and erosion.

» **Chemical 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 at 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 Regulations and guidelines should be followed:

- Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- South African Bureau of Standards, Standard SANS 10206 (2010)

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to "*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*".

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Agriculture, forestry and Fisheries (DAFF).

» **Biological control**

Biological weed control consists in the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

4.4. General management practices

The following general management practices should be encouraged or strived for:

» Establish an ongoing monitoring programme for construction phase to detect and quantify any alien species that may become established and identify the problem species.

- » Alien vegetation regrowth on areas disturbed by construction must be immediately controlled once recorded throughout the entire site during construction and operation.
- » Care must be taken to avoid the introduction of alien invasive plant species to the site. 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.
- » Cleared areas that have become invaded by alien species 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. Mechanical/ manual method should however also be considered as an option.
- » The effectiveness of vegetation control varies seasonally and this is also likely to impact alien species. Control early in the wet season will allow species to re-grow and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.
- » Alien management is an iterative process and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
- » Some alien species are best individually pulled by hand and in the case of *Opuntia* removed from the site.
- » Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
- » No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used
- » During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared using appropriate means.

4.5. Monitoring

In order to monitor the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide and assessment of the magnitude of alien invasion on site as well as an assessment of the success of the management programme.

In general, the following principles apply for monitoring:

- » Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.

- Simple records must be kept of daily operations, e.g. area/location cleared, labour units and, if ever used, the amount of herbicide used.
- It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring could be used as a baseline to ensure management of alien invasive plant species.

Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Preconstruction & monthly thereafter
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

Operation Phase

Monitoring Action	Indicator	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 cover over time at the site	Biannually
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

APPENDIX K:
ECOLOGICAL WALK-THROUGH REPORT

Application for a permit for the removal of Protected Trees from the Skuitdrift 1 Solar PV Energy Facility, situated on farm Skuitdrif 426, near Augrabies, Northern Cape, South Africa.

Prepared by

Leigh-Ann de Wet

(M.Sc., Pri. Sci. Nat)

For

Savannah Environmental
(on behalf of Scuitdrift Solar Project (Pty) Ltd)

August 2017

LD Biodiversity Consulting

Biodiversity Assessments, Baseline surveys and Impact Assessments and Integrated Biodiversity Management Solutions.

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Appointment of Specialist
Leigh-Ann de Wet (LD Biodiversity Consulting) was commissioned by Savannah Environmental to undertake a site walk through to identify any Protected Trees occurring within the development footprint and to provide the required information for the permitting process.

Details of Specialist
Leigh-Ann de Wet
LD Biodiversity Consulting

Telephone: 083 352 1936
e-mail: leighann.dewet@gmail.com

Expertise of the specialist (see Appendix 1 for CV)

- M.Sc. in Botany from Rhodes University.
- Registered Professional Natural Scientist with the South African Council for Natural Scientific Professionals (Ecological Science).
- Registered with RSPO as a certified High Conservation Value Assessor (Plants), since 2011.
- Founded LD Biodiversity Consulting in 2014.
- Ecological Consultant since 2009.
- Conducted, or have been involved in over 100 Ecological Impact Assessments, Baseline surveys, Biodiversity Action Plans and Offset Plans throughout Africa.
- Published four scientific papers, two popular articles and have three scientific papers in preparation.
- Presented 7 international conference presentations, and at two Botanical Society meetings.
- Lectured methods for specialist assessment for the Rhodes University short course on EIA.

Independence
Leigh-Ann de Wet and LD Biodiversity Consulting have no connection with Scuitdrift Solar Project (Pty) Ltd, and LD Biodiversity Consulting is not a subsidiary of any kind of Scuitdrift Solar Project (Pty) Ltd. The remuneration for services by Savannah Environmental in relation to this report and associated studies is unrelated to approval by decision-making authorities responsible for authorization of any Scuitdrift Solar Project (Pty) Ltd activity. LD Biodiversity Consulting has no interest in secondary developments as a result of this project.

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1 Introduction

1.1 Development description

Scuitdrift Solar Project (Pty) Ltd is developing a solar energy facility on the farm Skuitdrif 426 in the Northern Cape Province, approximately 50km north west of Augrabies and 68km north east of Pofadder. The development footprint is approximately 17ha in extent, and infrastructure including access roads, a substation and a transmission line is also planned. A Basic Assessment Process was conducted in 2016 and the development was approved.

1.2 Site description

The vegetation of the footprint is homogenous in nature, with some washes from high rainfall events. The description of the vegetation given by Todd (2016: Ecological Specialist Report) is as follows: "The plains within the development area are generally open with occasional scattered trees of *Acacia erioloba*, *Acacia mellifera* and *Boscia foetida*. The plains are dominated by the grasses *Stipagrostis uniplumis*, *S. ciliata* and *Schmidtia kalahariensis* with occasional shrubs such as *Rhigozum trichotomum, Phaeoptilum spinosum* and *Salsola rabieana*."

Site sensitivity was primarily medium, with the washes forming areas of high sensitivity and rocky outcrops forming very high sensitivity zones. Should the areas of high sensitivity be avoided, the destruction of *Acacia erioloba* individuals can be avoided. Sensitivity of the full site area is indicated in Figure 1.

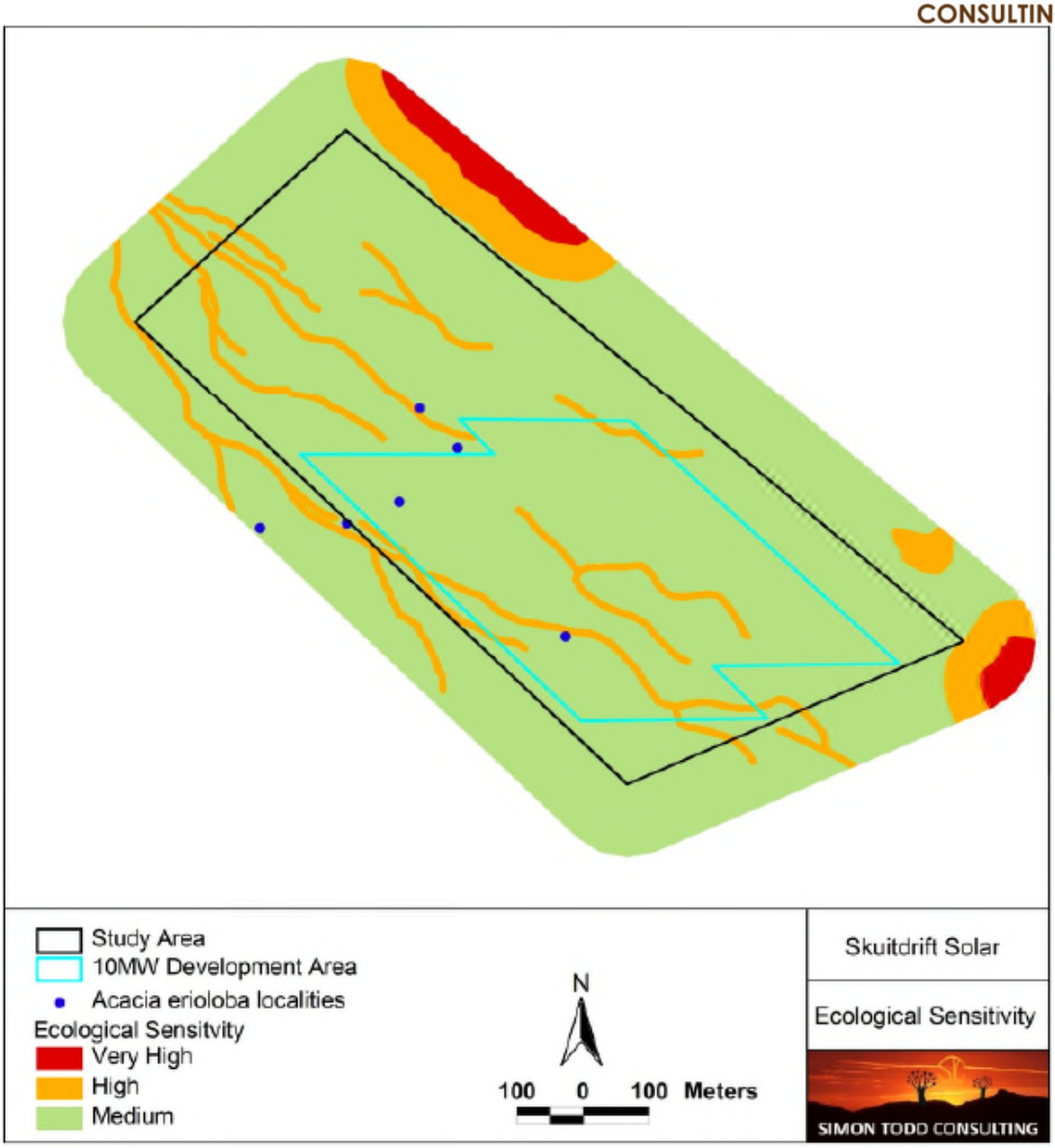

Figure 1.1: Sensitivity map of the Skuitdrift 1 Solar PV Energy Facility, as determined by the Ecological Specialist Report (Todd, 2016).

1.3 Flora Species Occurring on Site

Dominant species include trees in the washes (*Acacia erioloba, Acacia mellifera* and *Boscia foetida*), with dominant species in the plains being *Stipagrostis uniplumis*, *S. ciliata*, *Schmidtia ciliata*, *kalahariensis*, *Rhigozum trichotomum, Phaeoptilum spinosum* and *Salsola rabieana*.

One Protected Tree species was found on site: *Acacia erioloba* (Camel Thorn).

Two other species protected under legislation were located in the general area but not on the Skuitdrift 1 Solar PV Energy Facility and included:

- *Aloe dichotoma* (Quiver Tree) and *Hoodia gordonii* (Bokhorings), listed on Schedule 1 (Specially Protected Species) on the Northern Cape Nature Conservation Act no. 9 of 2009.
- *Hoodia Gordonii* is also listed as a Protected Species on the National Environmental Management: Biodiversity Act (Act 10 of 2004) under the Threatened or Protected Species (TOPS) regulations.

A full species list is presented in Appendix 2.

1.4 Information sources

- The information included in this report as to location and descriptions of *Acacia erioloba* individuals at the Skuitdrift 1 Solar PV Energy Facility is taken from the Ecological Specialist Report with field work conducted on the 29th February 2012 (Todd, 2016), in addition a site walk through conducted by Leigh-Ann de Wet on the 7th of August 2017 was undertaken.

2 Methodology

The site is flat and open, which makes it relatively easy to locate tall trees. In order to locate all *Acacia erioloba* individuals, the site was traversed on foot in transects 100 metres apart. GPS locations for each tree were recorded. *Acacia erioloba* trees located close to the footprint were also recorded.

3 Results

There are few *Acacia erioloba* trees on site, all of which are located within washes. These wash areas have been given a high sensitivity in the Ecological Specialist Report (Todd, 2016). All the *Acacia erioloba* trees encountered (six) are relatively small, three (3) metres or less in height with a narrow crown. Encountered trees were otherwise healthy. Figure 3.1 shows one of the *Acacia erioloba* trees located on the Skuitdrift 1 Solar PV Energy Facility. All GPS points are listed in Table 3.1. Figure 3.2 indicates the position of each of the trees on site.

Figure 3.1: ***Acacia erioloba*** **on site.**

Table 3.1: GPS locations of each *Acacia erioloba* located on the Skuitdrift 1 Solar PV Energy Facility

Number	Lat	Long
1	-28.612200°	19.778140°
2	-28.612700°	19.778660°
3	-28.613500°	19.777860°
4	-28.615300°	19.780130°
5	-28.613800°	19.775980°
6	-28.613800°	19.777150°

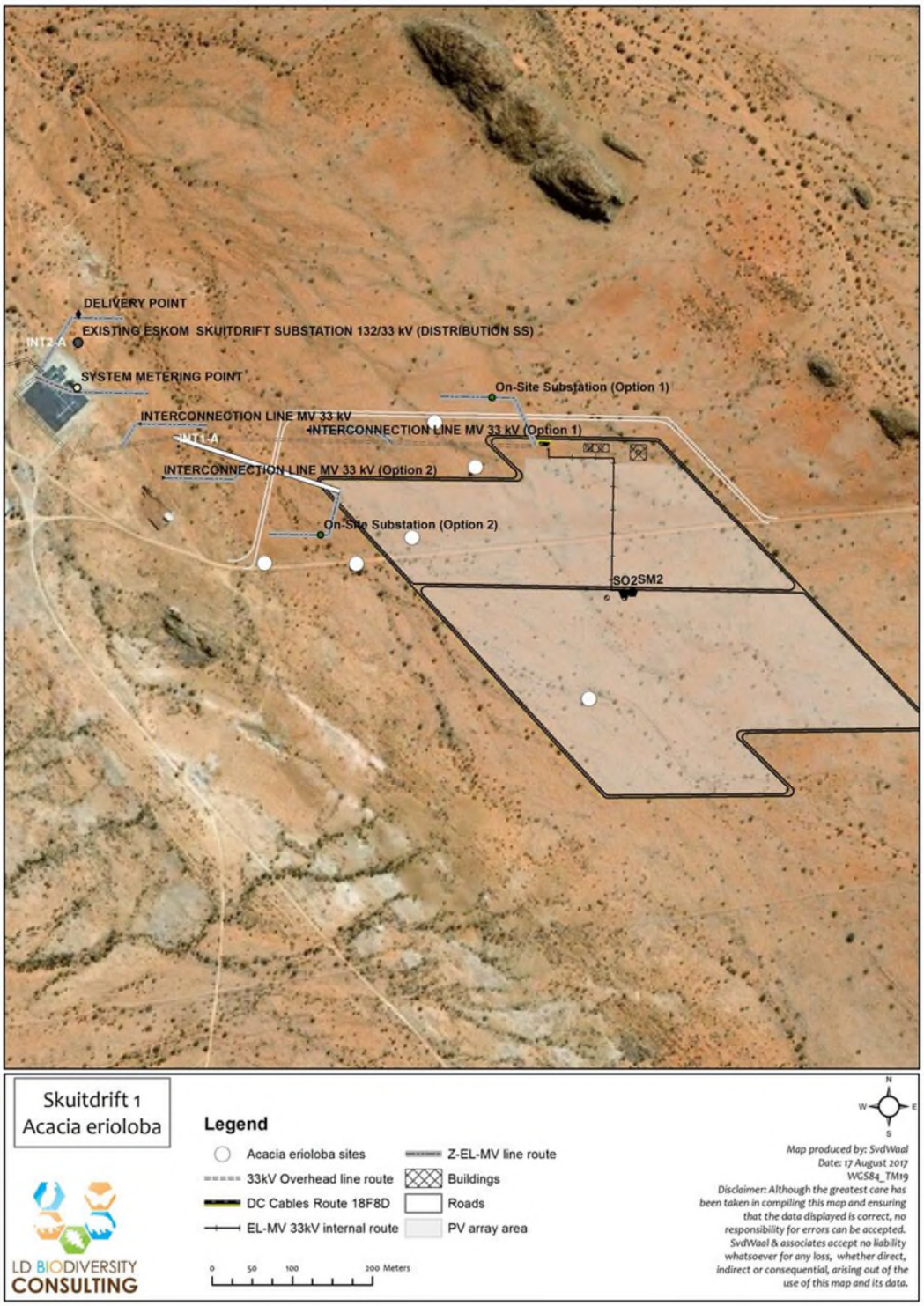

Figure 3.2: Location of all *Acacia erioloba* trees on the Skuitdrift 1 Solar PV Energy Facility in relation to the development footprint.

4 APPENDIX 1: Specialist CV

6 Beach Road Noordhoek Cape Town	**Leigh-Ann de Wet** **MSc | Pri. Sci. Nat.** **Biodiversity Specialist**	leigh- ann@ldbiodiversity.co.za 083 352 1936

Profile

A biodiversity specialist with a history in botanical research, biodiversity assessments and associated planning in developing countries. Possesses experience in classification of ecosystems and development of management and monitoring plans for a variety of ecosystems from the spiny thicket of Madagascar to the Rainforests of West and Central Africa. Experience also includes Biodiversity Assessments (comprising classification and mapping of ecosystems and habitats) of ecosystems and vegetation types throughout Southern Africa including grasslands, forests, thicket, bushveld and fynbos with associated conservation and management recommendations.

Key Expertise

Ecological research methodology development	Report and paper writing
Ecological research	Synthesis of specialist work into integrated assessments
Habitat and vegetation mapping	Ecological statistics
Habitat and vegetation classification	Environmental Management and Monitoring

Education

2005 - 2007	**MSc** in Botany – Rhodes University
2005	**BSc Honours** in Botany (with Distinction) – Rhodes University
2001 - 2004	**BSc** (Botany and Entomology) – Rhodes University

Courses

2013	Wetland Management: Introduction to Law – University of the Free State
2013	Wetland Management: Introduction and Delineation Short Course – University of the Free State
2011	Land Degradation Short Course – Rhodes University
2009	EIA Short Course – Rhodes University and Coastal and Environmental Services

Membership

2012 – Present	Professional Natural Scientist with SACNASP: Ecological Science (No. 400233/12)
2012 – Present	High Conservation Value Assessor (plants) with the Round Table of Sustainable Biofuels.

2013 – Present	South African Association of Botanists
2013 – Present	Botanical Society of South Africa
2013 – Present	Wildlife and Environment Society of South Africa
2013	Grasslands Society of Southern Africa

Professional experience

2014 - Current Owner of LD Biodiversity Consulting – Biodiversity Specialist

Started own company (Sole Proprietor) to focus on Ecological Assessments including baseline assessments (habitat and ecosystem classification) as well as Management and Monitoring for large projects. Responsibilities include:

- Ecological Surveys including Baseline Assessments, Biodiversity Management and Monitoring Plans and Spatial Planning for biodiversity goals to meet international standards
- Offset design
- Strategic Environmental Planning
- Mapping (QGIS)
- Research
- Financial Management

2012 - 2014 Digby Wells Environmental – Unity Manager: Biophysical

Management of the Biophysical Department, specifically Flora and Fauna although included the overseeing and review of both Freshwater Ecology and Wetlands as well. Responsibilities included:

- Conducting and management of Ecological Baseline and Impact Assessments to meet international standards
- Biodiversity Management and Monitoring Plans
- Management of a team of between four and seven colleagues and specialists

2009 – 2012 Coastal and Environmental Services – Senior Environmental Consultant and Ecological Specialist

Ecological specialist responsible for conducting ecological assessments including baseline and impact assessments for Fauna and Flora. Later in this time for overseeing junior ecologists and training. Key responsibilities included:

- Conducting Ecological Baseline and Impact Assessments to international standards
- Strategic environmental planning
- Managing teams of specialists
- Mapping (Arc)
- Research

2007 - 2009	Rhodes University (South Africa) and Sheffield University (England) – NERC Research Assistant

Design and conducting of a large common or garden experiment looking at the effects of global climate change on grassland composition. Key responsibilities included:

- Experimental design
- Experiment implementation
- Data analyses

Awards

2005	Best Young Botanist second prize for a presentation entitled: "Population biology and effects of harvesting on *Pelargonoium reniforme* (Geraniaceae) in Grahamstown and surrounding areas" at the SAAB conference. Dean's list, Academic Colours, Masters Scholarship.
2004	Putterill Prize for conservation in the Eastern Cape, Dean's list, Academic Half Colours, Honours Scholarship.
2001 - 2003	Dean's List

Publications

de Wet, L., Downsborough, L., Reimers, B., and Weah, C. (in prep). Traditional ecological knowledge and social survey as a proxy for large mammal scientific survey in Liberia.

de Wet, L., Downsborough, L., Reimers, B., and Weah, C (in prep). Traditional ecological knowledge and presence of large mammals in Liberia: a case study.

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2013	**LR de Wet** – Biodiversity Actions Plans for existing mines: Making them Work for Grassland Conservation - Grassland Society of Southern Africa Congress, Limpopo
2011	**LR de Wet** - Finding Ecological Benefits of Windfarms – Thicket Forum, Grahamstown
2010	Lubke, RA, N Davenport, **LR de Wet** and C Fordham – The ecology and distribution of endorheic pans in the subtropical thicket vegetation near Port Elizabeth, Eastern Cape, South Africa – International Association for Vegetation Science, 53rd Annual Symposium, Ensenada, Mexico.
2006	**LR de Wet,** Barker, N and Peter, C – Pollinator-mediated selection in *Pelargonium reniforme* as described by Inter Simple Sequence Repeat markers. – South African Association of Botanists (SAAB) conference.
2006	**LR de Wet**, Barker, N and Peter, C– Pollinator-mediated selection of *Pelargonium reniforme* and two floral morphs described by inter simple sequence repeat markers – Southern African Society for Systematic Biology (SASSB) conference.
2005	**LR de Wet** and Vetter, S – Population biology and effects of harvesting on *Pelargonium reniforme* (Geraniaceae) in Grahamstown and surrounding areas, Eastern Cape, South Africa – South African Association of Botanists (SAAB) conference.
2005	**LR de Wet** and Vetter, S – Harvesting of *Pelargonium reniforme* in Grahamstown; what are the implications for populations of the plant? – Thicket Forum
2005	**LR de Wet** – Harvesting of *Pelargonium reniforme* in Grahamstown; what are the implications for populations of the plant? – Annual general meeting. Botanical Society of South Africa, Albany Branch.
2004	**LR de Wet** – Population biology of *Pelargonium reniforme* – Annual general meeting. Botanical Society of South Africa, Albany Branch.

5 APPENDIX 2: Species List for the site

This species list has been generated from the Ecological Specialist Report (Todd, 2016) and includes all species mentioned as recorded on site.

Acacia erioloba
Acacia mellifera
Boscia foetida
Stipagrostis uniplumis
Stipagrostis ciliata
Schmidtia kalahariensis
Rhigozum trichotomum
Phaeoptilum spinosum
Salsola rabieana
Monechma spartioides
Hoodia gordonii
Aloe dichotoma

Application for a permit for the removal of a Schedule 2: Protected Species from Skuitdrift 1 Solar PV Energy Facility, situated on farm Skuitdrif 426, near Augrabies, Northern Cape, South Africa.

Prepared by

Leigh-Ann de Wet

(M.Sc., Pri. Sci. Nat)

For

Savannah Environmental

January 2018

LD Biodiversity Consulting

Biodiversity Assessments, Baseline surveys and Impact Assessments and Integrated Biodiversity Management Solutions.

leighann.dewet@gmail.com
083 352 1936

This report should be cited as:
L. de Wet (2017). Application for a permit for the removal of Schedule 2: Protected Species from Skuitdrift 1 Solar PV Energy Facility, situated on farm Skuitdrif 426, near Augrabies, Northern Cape, South Africa. LD Biodiversity Consulting upon appointment by Savannah Environmental.

Appointment of Specialist
Leigh-Ann de Wet (LD Biodiversity Consulting) was commissioned by Savannah Environmental, on behalf of Scuitdrift Solar Project (Pty) Ltd, to undertake a site walk through to identify any Protected Species occurring within the development footprint and to provide the required information for the permitting process.

Details of Specialist
Leigh-Ann de Wet
LD Biodiversity Consulting

Telephone: 083 352 1936
e-mail: leighann.dewet@gmail.com

Expertise of the specialist (see Appendix 1 for CV)

- M.Sc. in Botany from Rhodes University.
- Registered Professional Natural Scientist with the South African Council for Natural Scientific Professionals (Ecological Science).
- Registered with RSPO as a certified High Conservation Value Assessor (Plants), since 2011.
- Founded LD Biodiversity Consulting in 2014.
- Ecological Consultant since 2009.
- Conducted, or have been involved in over 100 Ecological Impact Assessments, Baseline surveys, Biodiversity Action Plans and Offset Plans throughout Africa.
- Published four scientific papers, two popular articles and have three scientific papers in preparation.
- Presented 7 international conference presentations, and at two Botanical Society meetings.
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1 Introduction

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1.2 Site description

The vegetation of the footprint is homogenous in nature, with some washes from high rainfall events. The description of the vegetation given by Todd (2016: Ecological Specialist Report) is as follows: "The plains within the development area are generally open with occasional scattered trees of *Acacia erioloba*, *Acacia mellifera* and *Boscia foetida*. The plains are dominated by the grasses *Stipagrostis uniplumis*, *S. ciliata* and *Schmidtia kalahariensis* with occasional shrubs such as *Rhigozum trichotomum, Phaeoptilum spinosum* and *Salsola rabieana*."

Site sensitivity was primarily medium, with the washes forming areas of high sensitivity and rocky outcrops forming very high sensitivity zones (Todd 2016). Sensitivity of the full site area is indicated in Figure 1.1.

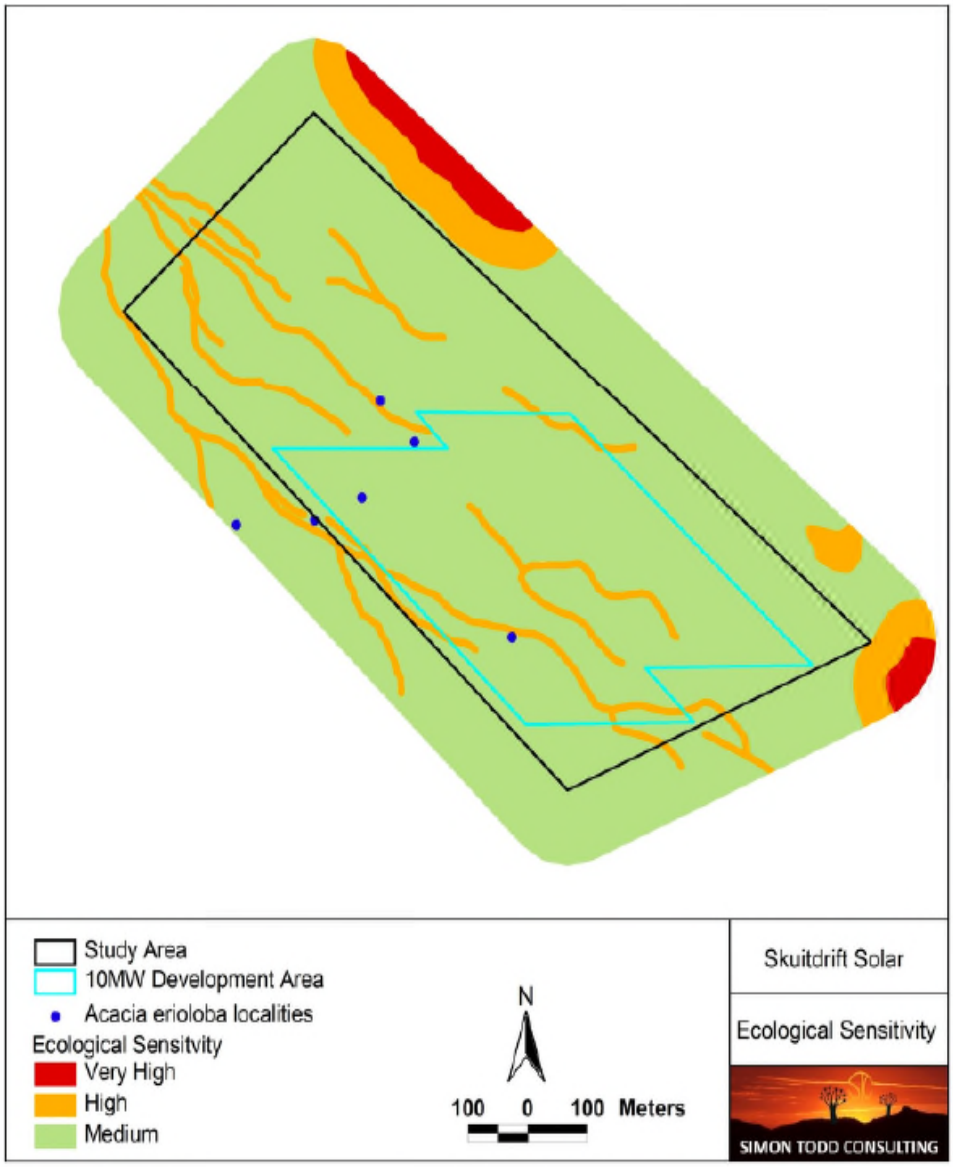

Figure 1.1: Sensitivity map of Skuitdrift 1 Solar PV Energy Facility, as determined by the Ecological Specialist Report (Todd, 2016).

1.3 Flora Species Occurring on Site

Dominant species include trees in the washes (*Acacia erioloba, Acacia mellifera* and *Boscia foetida*), with dominant species in the plains being *Stipagrostis uniplumis*, *S. ciliata*, *Schmidtia kalahariensis*, *Rhigozum trichotomum, Phaeoptilum spinosum* and *Salsola rabieana*.

Boscia foetida was found on site and is listed on Schedule 2 (Protected Species) on the Northern Cape Nature Conservation Act no. 9 of 2009. It should be noted that the methodology allowed for the recording of *Boscia* individuals seen in 100m transects of the site, as such, there are likely to be more individuals throughout the site.

A full species list for the site is presented in Appendix 2.

1.4 Assumptions and limitations

- The information included in this report as to the location and descriptions of *Boscia foetida* individuals at the Skuitdrift 1 Solar PV Energy Facility is taken from the Ecological Specialist Report with field work conducted on the 29th February 2012 (Todd, 2016) in addition to a site walk through conducted by Leigh-Ann de Wet on the 8th of August 2017.

2 Methodology

To locate all *Boscia foetida* individuals, the site was traversed on foot in transects 100 metres apart. GPS locations for each plant were recorded. *Boscia foetida* individuals located within 10m of the footprint were also recorded.

3 Results

3.1 Boscia foetida

There are twenty-nine (29) *Boscia foetida* (Figure 3.1) on site. The individuals found were healthy. All GPS points are listed in Table 3.1. Figure 3.2 indicates the position of each of the *Boscia foetida* on site. It should be noted that when protected species are removed, each should be photographed by the ECO.

Figure 3.1: *Boscia foetida* found on the Skuitdrift 1 Solar PV Energy Facility site.

Table 3.1: GPS locations of each *Boscia foetida* located on the Skuitdrift 1 Solar PV Energy Facility site.

Number	Lat	Long	Status
1	-28.615384°	19.780181°	Living
2	-28.615402°	19.779814°	Living
3	-28.615195°	19.780383°	Living
4	-28.615414°	19.780515°	Living
5	-28.615098°	19.781030°	Living
6	-28.615302°	19.781106°	Living
7	-28.614933°	19.780801°	Living
8	-28.614844°	19.782266°	Living
9	-28.615145°	19.782545°	Living
10	-28.614701°	19.783333°	Living
11	-28.616200°	19.781743°	Living
12	-28.616188°	19.781397°	Living
13	-28.616124°	19.781296°	Living
14	-28.616273°	19.781572°	Living
15	-28.615933°	19.780064°	Living
16	-28.614606°	19.778920°	Living

Number	Lat	Long	Status
17	-28.614322°	19.780510°	Living
18	-28.614410°	19.780178°	Living
19	-28.614144°	19.782168°	Living
20	-28.613463°	19.780780°	Living
21	-28.613655°	19.779626°	Living
22	-28.613709°	19.778546°	Living
23	-28.613741°	19.777673°	Living
24	-28.613724°	19.777882°	Living
25	-28.613919°	19.778278°	Living
26	-28.613463°	19.777387°	Living
27	-28.612681°	19.778762°	Living
28	-28.612665°	19.779815°	Living
29	-28.612322°	19.780509°	Living

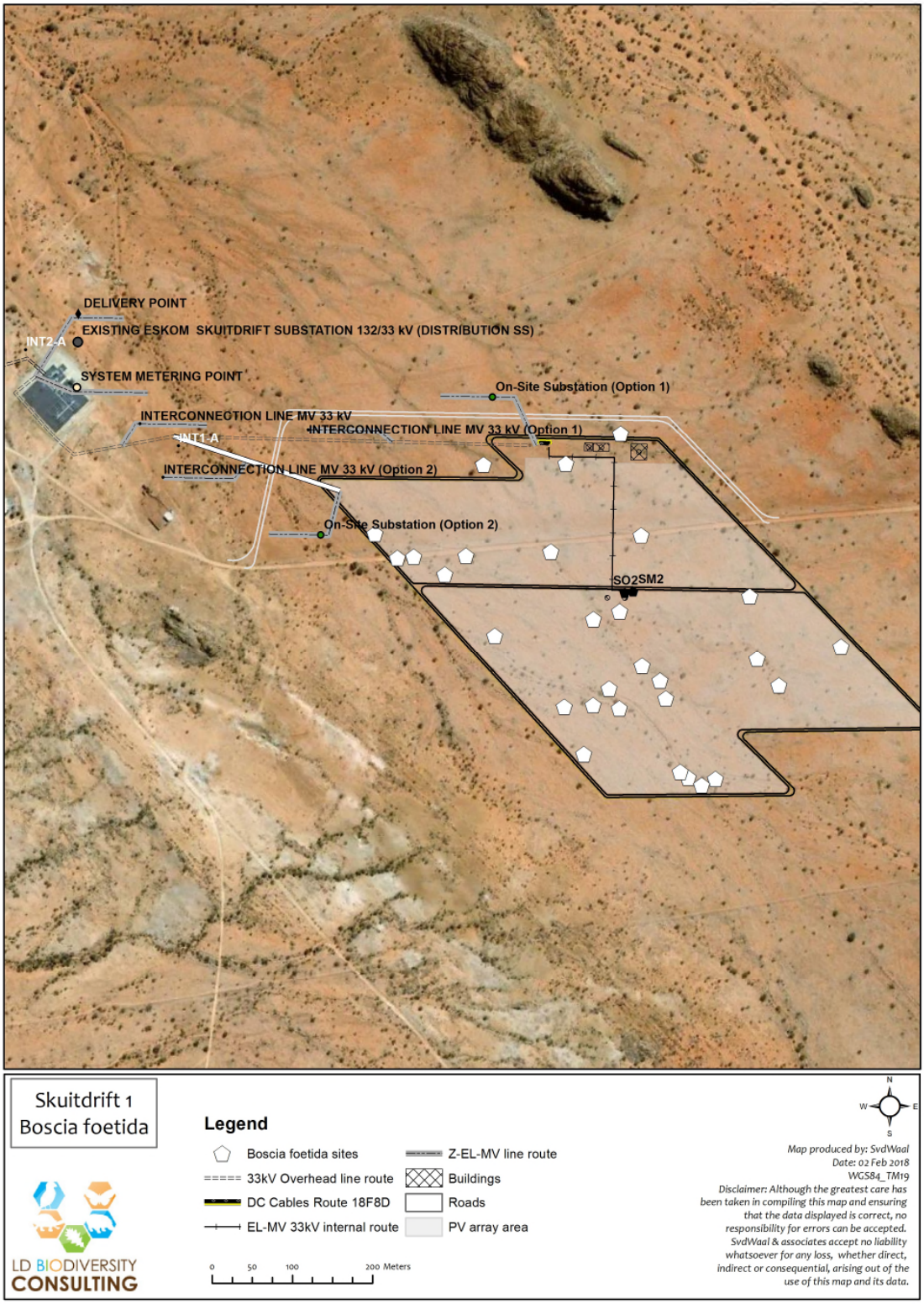

Figure 3.2: Locations of all *Boscia foetida* trees on Skuitdrift 1 Solar PV Energy Facility site in relation to the development footprint.

4 APPENDIX 1: Specialist CV

6 Beach Road
Noordhoek
Cape Town

Leigh-Ann de Wet
MSc | Pri. Sci. Nat.
Biodiversity Specialist

leighann.dewet@gmail.com
083 352 1936

Profile

A biodiversity specialist with a history in botanical research, biodiversity assessments and associated planning in developing countries. Possesses experience in classification of ecosystems and development of management and monitoring plans for a variety of ecosystems from the spiny thicket of Madagascar to the Rainforests of West and Central Africa. Experience also includes Biodiversity Assessments (comprising classification and mapping of ecosystems and habitats) of ecosystems and vegetation types throughout Southern Africa including grasslands, forests, thicket, bushveld and fynbos with associated conservation and management recommendations.

Key Expertise

Ecological research methodology development	Report and paper writing
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2013	Wetland Management: Introduction to Law – University of the Free State
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2009	EIA Short Course – Rhodes University and Coastal and Environmental Services

Membership

2012 – Present	Professional Natural Scientist with SACNASP: Ecological Science (No. 400233/12)
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2013 – Present	South African Association of Botanists
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2013	Grasslands Society of Southern Africa

Professional experience

2014 - Current Owner of LD Biodiversity Consulting – Biodiversity Specialist

Started own company (Sole Proprietor) to focus on Ecological Assessments including baseline assessments (habitat and ecosystem classification) as well as Management and Monitoring for large projects. Responsibilities include:

- Ecological Surveys including Baseline Assessments, Biodiversity Management and Monitoring Plans and Spatial Planning for biodiversity goals to meet international standards
- Offset design
- Strategic Environmental Planning
- Mapping (QGIS)
- Research
- Financial Management

2012 - 2014 Digby Wells Environmental – Unity Manager: Biophysical

Management of the Biophysical Department, specifically Flora and Fauna although included the overseeing and review of both Freshwater Ecology and Wetlands as well. Responsibilities included:

- Conducting and management of Ecological Baseline and Impact Assessments to meet international standards
- Biodiversity Management and Monitoring Plans
- Management of a team of between four and seven colleagues and specialists

2009 – 2012 Coastal and Environmental Services – Senior Environmental Consultant and Ecological Specialist

Ecological specialist responsible for conducting ecological assessments including baseline and impact assessments for Fauna and Flora. Later in this time for overseeing junior ecologists and training. Key responsibilities included:

- Conducting Ecological Baseline and Impact Assessments to international standards
- Strategic environmental planning
- Managing teams of specialists
- Mapping (Arc)
- Research

2007 - 2009	Rhodes University (South Africa) and Sheffield University (England) – NERC Research Assistant

Design and conducting of a large common or garden experiment looking at the effects of global climate change on grassland composition. Key responsibilities included:

- Experimental design
- Experiment implementation
- Data analyses

Awards

2005	Best Young Botanist second prize for a presentation entitled: "Population biology and effects of harvesting on *Pelargonium reniforme* (Geraniaceae) in Grahamstown and surrounding areas" at the SAAB conference. Dean's list, Academic Colours, Masters Scholarship.
2004	Putterill Prize for conservation in the Eastern Cape, Dean's list, Academic Half Colours, Honours Scholarship.
2001 - 2003	Dean's List

Publications

de Wet, L., Downsborough, L., Reimers, B., and Weah, C. (in prep). Traditional ecological knowledge and social survey as a proxy for large mammal scientific survey in Liberia.

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2013	**LR de Wet** – Biodiversity Actions Plans for existing mines: Making them Work for Grassland Conservation - Grassland Society of Southern Africa Congress, Limpopo
2011	**LR de Wet** - Finding Ecological Benefits of Windfarms – Thicket Forum, Grahamstown
2010	Lubke, RA, N Davenport, **LR de Wet** and C Fordham – The ecology and distribution of endorheic pans in the subtropical thicket vegetation near Port Elizabeth, Eastern Cape, South Africa – International Association for Vegetation Science, 53rd Annual Symposium, Ensenada, Mexico.
2006	**LR de Wet,** Barker, N and Peter, C – Pollinator-mediated selection in *Pelargonium reniforme* as described by Inter Simple Sequence Repeat markers. – South African Association of Botanists (SAAB) conference.
2006	**LR de Wet**, Barker, N and Peter, C– Pollinator-mediated selection of *Pelargonium reniforme* and two floral morphs described by inter simple sequence repeat markers – Southern African Society for Systematic Biology (SASSB) conference.
2005	**LR de Wet** and Vetter, S – Population biology and effects of harvesting on *Pelargonium reniforme* (Geraniaceae) in Grahamstown and surrounding areas, Eastern Cape, South Africa – South African Association of Botanists (SAAB) conference.
2005	**LR de Wet** and Vetter, S – Harvesting of *Pelargonium reniforme* in Grahamstown; what are the implications for populations of the plant? – Thicket Forum
2005	**LR de Wet** – Harvesting of *Pelargonium reniforme* in Grahamstown; what are the implications for populations of the plant? – Annual general meeting. Botanical Society of South Africa, Albany Branch.
2004	**LR de Wet** – Population biology of *Pelargonium reniforme* – Annual general meeting. Botanical Society of South Africa, Albany Branch.

5 APPENDIX 2: Species List for the site

This species list has been generated from the Ecological Specialist Report (Todd, 2016) and includes all species mentioned as recorded on site.

Acacia erioloba
Acacia mellifera
Boscia foetida
Stipagrostis uniplumis
Stipagrostis ciliata
Schmidtia kalahariensis
Rhigozum trichotomum
Phaeoptilum spinosum
Salsola rabieana
Monechma spartioides
Hoodia gordonii
Aloe dichotoma

APPENDIX L:
HERITAGE WALK-THROUGH REPORT

McGregor Museum
Department of Archaeology

SKUITDRIFT 1 SOLAR PV ENERGY FACILITY

(SCUITDRIFT SOLAR PROJECT (PTY) LTD)

NEAR POFADDER, NORTHERN CAPE

ARCHAEOLOGY SPECIALIST
WALK-THROUGH SURVEY

David Morris
October 2017

SKUITDRIFT 1 SOLAR PV ENERGY FACILITY
ON THE FARM SKUITDRIF 426
NEAR POFADDER, NORTHERN CAPE

ARCHAEOLOGY SPECIALIST WALK-THROUGH SURVEY

David Morris, McGregor Museum, Kimberley & Sol Plaatje University, Kimberley
P.O. Box 316 Kimberley 8300
Tel 082 2224777 email dmorriskby@gmail.com
October 2017

1. Introduction and Background

The McGregor Museum was approached by Savannah Environmental (Ref SE1784) to carry out a heritage walk-through survey for the solar energy project proposed by Scuitdrift Solar Project (Pty) Ltd, to be situated on the farm Skuitdrif 426 near Pofadder in the Northern Cape. This report provides an archaeology specialist walk-through survey of the footprint of a proposed construction of a 5 MW photovoltaic solar facility. Previously, Phase 1 Impact Assessments had been provided for Archaeology (Smith 2012) and Palaeontology (Almond 2012) within the site, together with an integrated Heritage Impact Assessment (De Kock 2012). Environmental Authorisation was granted on 23 March 2017.

The PV facility is proposed to make use of solar photovoltaic (PV) technology and include the following infrastructure: Arrays of solar photovoltaic (PV) panels; appropriate tracker/mounting structures; cabling between the project components, to be lain underground where practical; fencing around the facility; security and ablution facilities; two 10kL rainwater tanks; internal and external access roads; laydown area; site office, store room and control room buildings; inverter stations; onsite substation and transformers; and 33kV overhead power line to evacuate the power from the facility into the Eskom grid at the nearby existing Eskom Schuitdrift Substation. Existing roads will be upgraded and used for the facility where possible, however internal access roads will have to be constructed.

2. Specialist

The author of this report is an archaeologist accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists, employed at Head of Archaeology at the McGregor Museum in Kimberley and an Extraordinary Professor in the School of Humanities, Sol Plaatje University, Kimberley. Work has previously been carried by the author in the region of the proposed activity (Morris 1999a-b, 2000a-c, 2001, 2010, 2012, 2014).

The author works independently of the organisation commissioning specialist input, and provides these walk-through survey observations within the framework of the National Heritage Resources Act (No 25 of 1999).

The National Heritage Resources Act no. 25 of 1999 (NHRA) protects heritage resources which include archaeological and palaeontological objects/sites older than 100 years, graves older than 60 years, structures older than 60 years, as well as intangible values attached to places. The Act requires that anyone intending to disturb, destroy or damage such sites, objects and/or structures may not do so without a permit from the relevant heritage resources authority. This is the context for this walk-through survey and specialist report, required by the relevant heritage resources authority/ies to assess whether there are any sensitive heritage resources located within the site and whether authorisation may be granted for the disturbance or alteration, or destruction of the identified heritage resources.

3. Description of the receiving environment and potential impacts

The environment is arid, comprising a barren, almost featureless, gently sloping drainage plain situated about 12km south of the Orange River, north east of Pofadder. The landscape being sparsely vegetated, surface archaeological traces are likely to be highly visible.

Figure 1. Google Earth image of the terrain indicating the locality of the site some 12 km south of the Orange River.

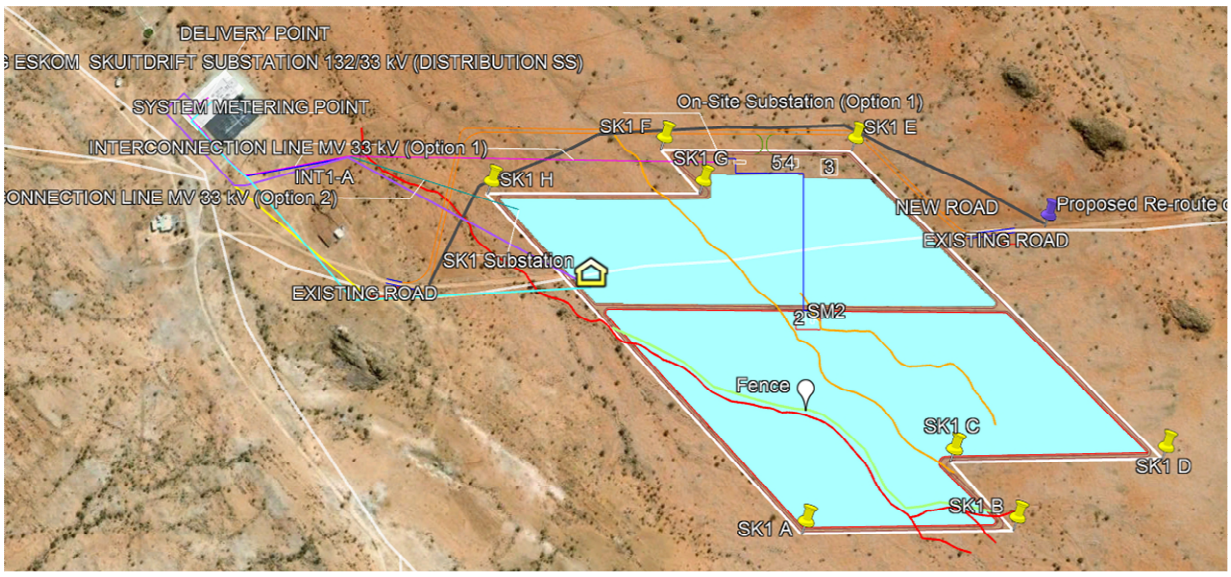

Figure 2. Google Earth image showing the proposed Skuitdrift 1 Solar PV Energy Facility footprint, with existing roads, proposed new roads, and the transmission line to the existing Eskom Schuitdrift substation.

4. Heritage features of the region

Background information on heritage features known or expected in the region is the same, in its essential outline, to that noted in previous reports for similar landscapes near Pofadder (e.g. Morris 2014). The Phase 1 Archaeological Impact Assessment report by Smith (2012; cf. De Kock 2012) produced findings in accord with this expectation.

Colonial frontier

The eighteenth- and nineteenth-century records for this region (Penn 2005) include the travelogues of George Thompson (1827) and E.J. Dunn (1931, Robinson 1978), who visited the region in 1824 and 1872 respectively. Place names were becoming fixed in this colonial frontier period (in a cadastral sense, on maps and in farm names), many such names having Khoekhoegowab origins encapsulating vestiges of precolonial/indigenous social geography. Genocide against the indigenous people is documented in this area (Anthing 1863; de Prada Samper 2012), with certain mountainous areas (like Gamsberg near Aggeneys and Namies) being the likely settings of massacre sites, referred to by Dunn in 1872 (Robinson 1978) and, more obliquely, by Anthing (1863; Jose Manuel de Prada-Samper pers. comm. 2009). Dunn refers to conflict at Zwart Modder, a farm south of Skuitdrift, where he recorded an isolated grave of a member of the Northern Border Police (which has yet to be relocated).

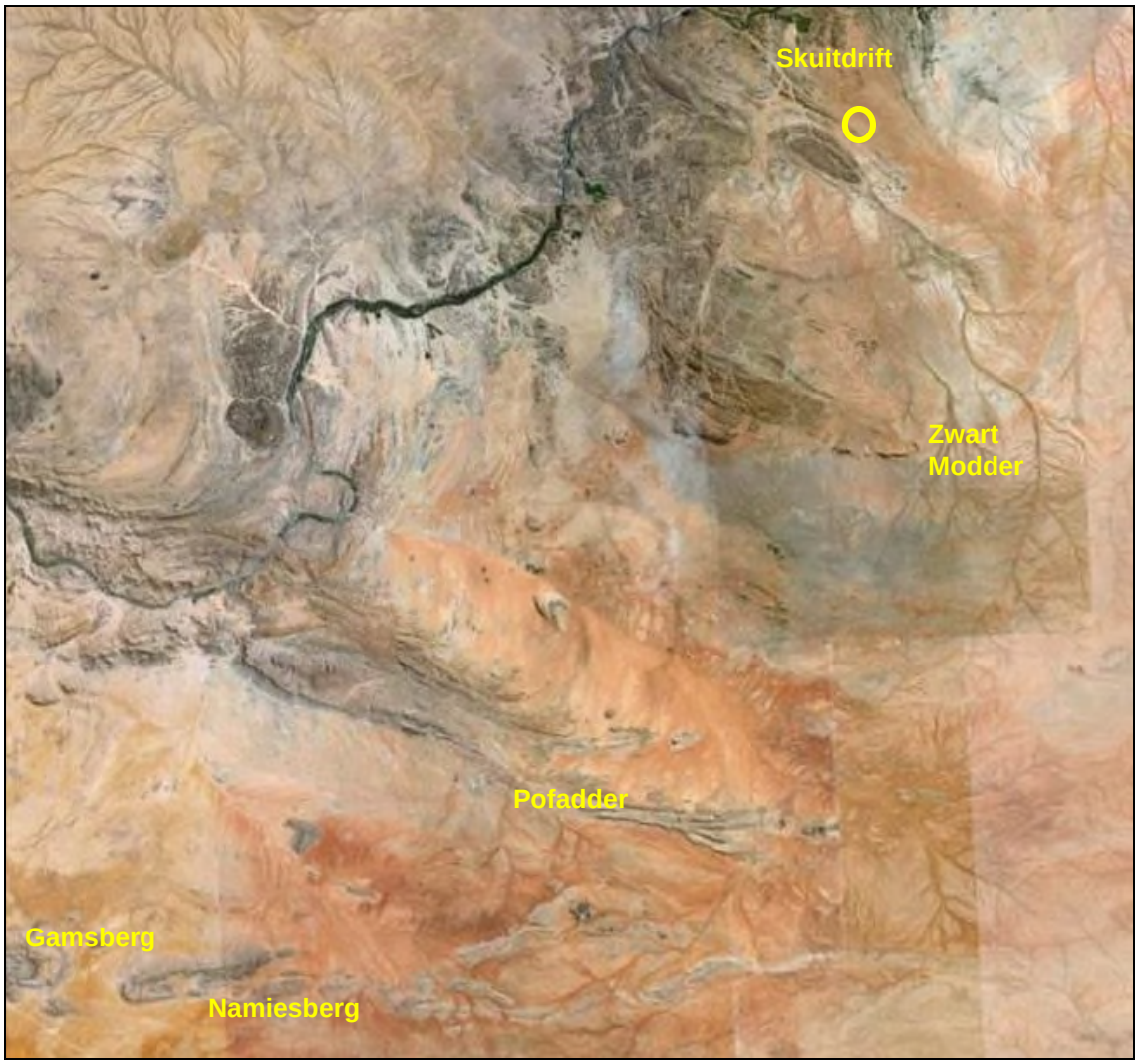

Figure 3. Regional focus: the study area relative to Skuitdrift, Pofadder and some other places mentioned.

Later Stone Age

Late Holocene Later Stone Age (LSA) sites are the predominant archaeological trace noted in surveys in the Aggeneys-Pofadder region (Morris 1999a-b, 2000a-c, 2001, 2010). Beaumont *et al*. (1995) have shown, with reference to the LSA, that "virtually all the Bushmanland sites so far located appear to be ephemeral occupations by small groups in the hinterland on both sides of the [Orange] river" (1995:263). This was in sharp contrast to the substantial herder encampments along the Orange River floodplain itself (Morris & Beaumont 1990), which reflected the "much higher productivity and carrying capacity of these bottom lands." "Given choice, the optimal exploitation zone for foragers would have been the Orange River." The appearance of herders in the Orange River Basin, Beaumont *et al*. argued, led to competition over resources and ultimately to marginalisation of hunter-gatherers, some of whom then occupied Bushmanland, probably mainly in the last millennium, and focused their hunting and gathering activities around the limited number of water sources in the region. Surveys have located signs of

human occupation mainly in the shelter of granite inselbergs (as indeed found here by Smith 2012), on red dunes which provided clean sand for sleeping, or around the seasonal pans (Beaumont *el al*. 1995:264). Possibly following good rains, herders moved into the Orange River hinterland, as attested archaeologically at sites with ample pottery near Aggeneys and, east of Pofadder, at Schuitdrift South – Morris 1999a). However, Thompson (1824) refers to herder groups settled at the stronger springs such as Pella dispersing during periods of drought to smaller springs in the region, which could equally well account for the traces referred to here. Dunn, in 1872, refers to a place at Schuit Klip where water accumulated following rains and was still available after a year of no rain in the vicinity (Robinson 1978:60-61). At such times competition between groups over resources and stress within an already marginalised hunter-gatherer society, must have intensified.

Pleistocene: Middle and Earlier Stone Age

Beaumont *et al*. (1995:240-1) have noted a widespread low density stone artefact scatter of Pleistocene age across areas of Bushmanland to the south where raw materials, mainly quartzite cobbles, were derived from extensive surface spreads of Dwyka tillite. Systematic collections of this material made at Olyvenkolk, south west of Kenhardt and Maans Pannen, and east of Gamoep, could be separated out by abrasion state into a fresh component of Middle Stone Age (MSA) with prepared cores, blades and points, and a large aggregate of moderately to heavily weathered Earlier Stone Age (ESA).

Beaumont *et al*. have shown that "substantial MSA sites are uncommon in Bushmanland" (1995:241): and those that have been documented thus far have generally yielded only small samples (Morris & Beaumont 1991; Smith 1995).

The ESA included Victoria West cores on dolerite, long blades, and a very low incidence of handaxes and cleavers. The Middle (and perhaps in some instances Lower) Pleistocene occupation of the region that these artefacts reflect must have occurred at times when the environment was more hospitable than today. This is suggested by the known greater reliance of people in Acheulean times on quite restricted ecological ranges, with proximity to water being a recurrent factor in the distribution of sites.

5. Description and evaluation of environmental issues and potential impacts

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Area and linear developments such as those envisaged can have a permanent destructive impact on these resources. The original heritage impact assessments (Smith 2012, Almond 2012, De Kock 2012) evaluated the sensitivity and significance of such resources where present with a view to recommending no-go areas and/or measures to mitigate or manage the said impacts.

The walk-through survey follows authorisation of the proposed facility and addresses the appropriateness of the layout relative to heritage resources and sensitivities.

6. Potential areas of sensitivity

Based on previous experience in the area (including Smith 2012), it is estimated that any terrain close to hills or rocky features, particularly sandy spots near sheltering rocks, may tend to have traces of precolonial Stone Age occupation/activity.

No such features occur on the actual footprint of the proposed development.

While places in the open plains have been found to have sparsely scattered artefacts (such as at Konkoonsies near the Paulputs Substation site – Morris 1999a), these areas are expected to be less significant. An exception to this is where rocky outcrops at the surface on the plains provide places where water pools exist after rains. Such places often attracted people in the past with traces of this including artificial grinding grooves in the bedrock and ample evidence of stone artefacts and pottery. A very good example of this is at Schuitdrift South about 3 km east of the development at 28º36'46" S 19º48'46" E. It is in fact described in some detail by Dunn (Robinson 1978:60-61): "Two holes occur in the gneiss at the crest of a ridge … when heavy thunder rains sweep over this arid country the water runs into and sometimes fills these most useful reservoirs, in which it is stored up and lasts many months."

Once again, there are no indications of such features on the footprint of the proposed development.

Colonial era sites or features within the study area include farm infrastructure, and a grave site beyond the footprint that was noted by De Kock (2012).

The objective of the walk-through survey is to assess the authorised layout relative to the above potential areas or sensitivities, given that disturbance of surfaces in the development area could have a destructive impact on heritage resources. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, the Northern Cape Heritage Resources Authority. Should exceptional heritage features be found (not considered likely), some could require preservation *in situ* and hence modification of the intended placement of development components may be required.

Disturbance of any surface includes any construction: of a road, a pipeline, erection of a pylon, or preparation of a site for a substation, or plant, or building, or any other *clearance* of, or *excavation* into, a land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed, which is also possible). Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation.

7. Criteria to assess significance where archaeological resources are found

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon nd, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes *any* trace, even of only Type 1 quality, can be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Assessing site value by attribute

Table 2 (below) is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near feature such as hill	On old river terrace
L4	Sandy ground, Coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5

Class	Landform	Type 1	Type 2	Type 3
				myrs
L8	Rock shelter	Rocky floor	Sloping floor or small area	Flat floor, high ceiling
Class	**Archaeological traces**	**Type 1**	**Type 2**	**Type 3**
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell or bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997)

Class	Attribute	Type 1	Type 2	Type 3
1	Length of sequence/context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte/ecofacts
2	Presence of exceptional items (incl regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

8. Methodology & Limitations

The area being relatively small, our team of three scanned across the full extent of (and beyond) the footprint during the walk-through survey (Fig. 4 indicates the track taken by one of the three and all of the heritage resources located).

An assumption made in this study is that, by and large in this landscape, some sense of the archaeological traces to be found in the area would be apparent from surface observations (including assessment of places of erosion or past excavations that expose erstwhile below-surface features). There remains the possibility that during construction sites or features of significance could be encountered in the sub-surface (this could include an unmarked burial, or a high density of stone tools, for instance), in which case specified steps are necessary (cease work and report to heritage authority).

Nineteenth- and twentieth-century cultural history and intangible heritage values attached to places are difficult to recover owing to the sparse population.

The manner in which archaeological traces might be affected by the proposed development has been indicated above, but can be summed up in the following terms: it would be any act or activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). The most obvious impact in this case would be land surface disturbance associated with infrastructure construction.

9. Findings: walk-through survey observations

The study area was visited on 4 October 2017 by an archaeology team from the McGregor Museum including the author (D. Morris) and assistants (A. Henderson and J. Louw), to carry out a walk-through survey of the proposed development footprint of the Skuitdrift 1 Solar PV Energy Facility site.

Figure 4. The track followed by one of the team members.

The lack of topographical features such as rocky outcrops, major watercourses, or dunes, suggested on the basis of prior experience of the archaeology of the region that the development footprint was not likely to be rich in archaeological traces of major significance.

This prediction was proven to be correct in terms of the very sparse observations tabulated below.

The sandy plain across which the proposed facility is to be developed, was found to have zero to extremely low density occurrences of Stone Age material, which occurs, when present, as isolated stone tool flakes, seemingly of Later Stone Age character. This finding is consistent with that of Smith (2012) who found that higher density sites occur against the hills north east of the layout. Unconsolidated sand across the extent of the site may mask higher numbers of artefacts below the surface, but it is not anticipated that numbers would be significantly higher, based on observations of the more eroded surface adjacent (west) to the development footprint (Morris 2017).

Observation No	Latitude	Longitude	Description	Sensitivity
2017/1	28°36'50.9"	19°46'43.4"	Two cf. Later Stone Age isolated quartz flakes	LOW
2017/2	28°37'50.9"	19°47'04.4"	Later Stone Age isolated quartz flake	LOW
2017/3	28°37'02.4"	19°46'57.3"	Later Stone Age isolated quartz flake	LOW
2017/4	28°36'52.3"	19°46'44.3"	Colonial era tin (rusted)	LOW
2017/5	28°36'46.5"	19°46'49.5"	Later Stone Age: isolated quartz flake.	LOW

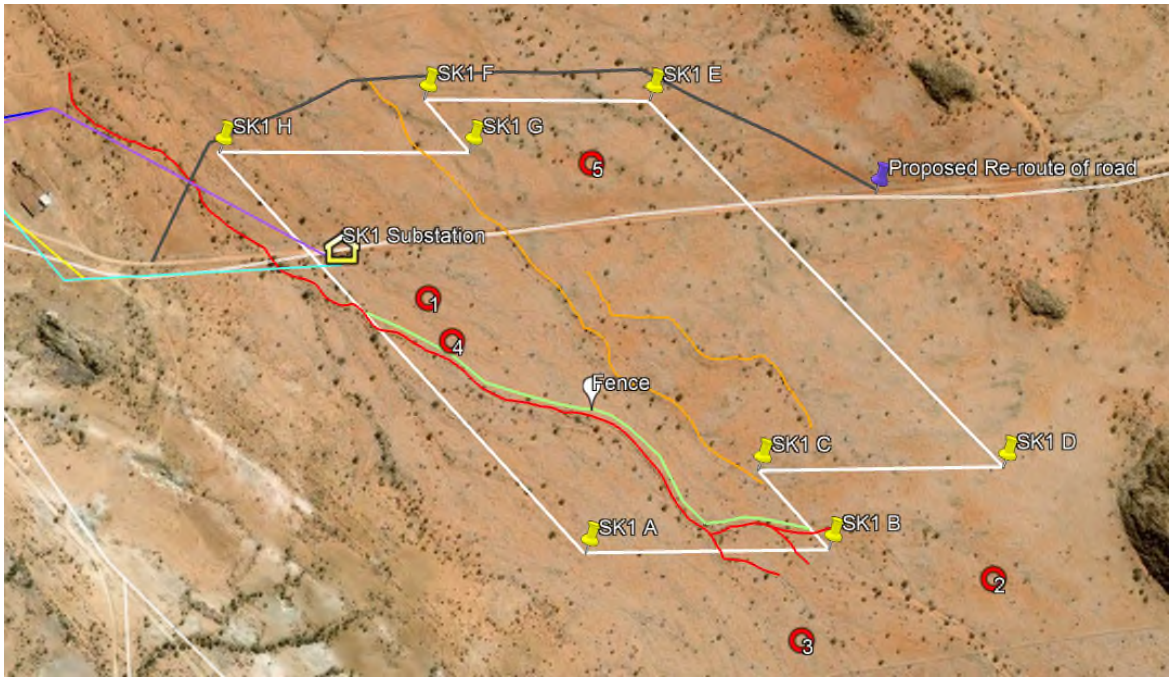

Figure 5. Observations 1-5 relative to the footprint of the proposed solar energy facility including the area identified for realignment of the road as indicated in Figure 2. This distribution of isolated finds reflects an extremely low incidence of archaeological or cultural heritage traces within the footprint (as previously observed by Smith 2012).

Figure 6. A view south eastward across the proposed facility footprint.

Figure 7. A view eastward across the proposed facility footprint.

Figures 8 a & b. Quartz artefacts found in the course of the walk-through.

Figure 9. Flattened tin, rusted, earlier twentieth century.

A grave site was documented by De Kock (2012:11 para 8.1) at a point north of the layout at 28º36’32” S 19º46’29” E, situated well to the north of the development where potential impact has been characterised as low (cf. SAHRA Final Comment 16 Nov 2016).

10. Conclusion

The walk-through survey has found that the footprint of the proposed Skuitdrift 1 Solar PV Energy Facility contains extremely sparse traces of Stone Age and colonial era heritage. The significance of impact is concluded to be LOW. Criteria applied (Tables 1 and 2) indicate Landform 3 Type 1 (Low significance), Archaeological trace Class 3 Type 1 (Low significance) and Type 1 for all of the Site Attribute classes (Low significance).

In terms of secondary or cumulative impacts (unlikely as they would apply only outside of the layout of the facility), the higher density artefact scatters against the nearby hills to the north east, noted by Smith (2012), must be avoided; while the existence of a sensitive high-density Later Stone Age site at Schuitdrift South, situated at 28º36'46" S 19º48'46" E, about 3 km to the east of the proposed development, is also noted. These higher/high-density sites in the wider landscape serve to further benchmark the low significance of archaeological materials found on the facility footprint during this walk-through survey.

Acknowledgements

The author thanks Savannah Environmental for assistance with information after commissioning the McGregor Museum to carry out this walk-through survey; farmer Mr Stephanus Nel who granted access to the land; and field assistants Abenicia Henderson and Jani Louw who helped walk the layout.

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APPENDIX M:
CURRICULUM VITAE

savannah environmental

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Woodlands Drive, Woodmead
Johannesburg, South Africa

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CURRICULUM VITAE OF JO-ANNE THOMAS

Profession:	Environmental Management and Compliance Consultant; Environmental Assessment Practitioner
Specialisation:	Environmental Management; Strategic environmental advice; Environmental compliance advice & monitoring; Environmental Impact Assessments; Policy, strategy & guideline formulation; Project Management; General Ecology
Work experience:	Twenty one (21) years in the environmental field

VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Key focus on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Undertaking of numerous environmental management studies has resulted in a good working knowledge of environmental legislation and policy requirements. Recent projects have been undertaken for both the public- and private-sector, including compliance advice and monitoring, electricity generation and transmission projects, various types of linear developments (such as National Road, local roads and power lines), waste management projects (landfills), mining rights and permits, policy, strategy and guideline development, as well as general environmental planning, development and management.

SKILLS BASE AND CORE COMPETENCIES

- Project management for a range of projects
- Identification and assessment of potential negative environmental impacts and benefits through the review and manipulation of data and specialist studies
- Identification of practical and achievable mitigation and management measures and the development of appropriate management plans
- Compilation of environmental reports in accordance with relevant environmental legislative requirements
- External and peer review of environmental reports & compliance advice and monitoring
- Formulation of environmental policies, strategies and guidelines
- Strategic and regional assessments; pre-feasibility & site selection
- Public participation processes for a variety of projects
- Strategic environmental advice to a wide variety of clients both in the public and private sectors
- Working knowledge of environmental planning processes, policies, regulatory frameworks and legislation

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc Earth Sciences, University of the Witwatersrand, Johannesburg (1993)
- B.Sc Honours in Botany, University of the Witwatersrand, Johannesburg (1994)
- M.Sc in Botany, University of the Witwatersrand, Johannesburg (1996)

Short Courses:

- Environmental Impact Assessment, Potchefstroom University (1998)
- Environmental Law, Morgan University (2001)
- Environmental Legislation, IMBEWU (2017)
- Mining Legislation, Cameron Cross & Associates (2013)
- Environmental and Social Risk Management (ESRM), International Finance Corporation (2018)

Professional Society Affiliations:

- Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: Environmental Scientist (400024/00)
- Registered with the International Associated for Impact Assessment South Africa (IAIAsa): 5601
- Member of the South African Wind Energy Association (SAWEA)

EMPLOYMENT

Date	Company	Roles and Responsibilities
2006 - Current	Savannah Environmental (Pty) Ltd	Director Project manager Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor.
1997 – 2005	Bohlweki Environmental (Pty) Ltd	Senior Environmental Scientist at. Environmental Management and Project Management
January – July 1997	Sutherland High School, Pretoria	Junior Science Teacher

PROJECT EXPERIENCE

Project experience includes large infrastructure projects, providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental permitting, Public Participation, Environmental Management Plans (EMPs) and Programmes (EMPrs), environmental policy, strategy and guideline formulation, and integrated environmental management; with a key focus on strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures.

RENEWABLE POWER GENERATION PROJECTS: PHOTOVOLTAIC SOLAR ENERGY FACILITIES

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Adams Solar PV Project Two South of Hotazel, Northern Cape	Enel Green Power	Project Manager
ECO for the construction of the Kathu PV Facility, Northern Cape	REISA	Project Manager
ECO and bi-monthly auditing for the construction of the Pulida PV Facility, Free State	Enel Green Power	Project Manager

Project Name & Location	Client Name	Role
ECO for the construction of the RustMo1 SEF, North West	Momentous Energy	Project Manager
ECO for the construction of the Sishen SEF, Northern Cape	Windfall 59 Properties	Project Manager
ECO for the construction of the Upington Airport PV Facility, Northern Cape	Sublanary Trading	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Kathu PV facility, Northern Cape	REISA	Project Manager
ECO for the construction of the Konkoonsies II PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
ECO for the construction of the Aggeneys PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager

Compliance Advice and ESAP Reporting

Project Name & Location	Client Name	Role
Aggeneys Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Airies II PV Facility SW of Kenhardt, Northern Cape	BioTherm Energy	Environmental Advisor
Kalahari SEF Phase II in Kathu, Northern Cape	Engie	Environmental Advisor
Kathu PV Facility, Northern Cape	Building Energy	Environmental Advisor
Kenhardt PV Facility, Northern Cape	BioTherm Energy	Environmental Advisor
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Environmental Advisor
Konkoonises II SEF near Pofadder, Northern Cape	BioTherm Energy	Environmental Advisor
Konkoonsies Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Lephalale SEF, Limpopo	Exxaro	Environmental Advisor
Pixley ka Seme PV Park, South-East of De Aar, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Environmental Advisor
Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Environmental Advisor
Sirius PV Plants, Northern Cape	Aurora Power Solutions	Environmental Advisor
Upington Airport PV Power Project, Northern Cape	Sublunary Trading	Environmental Advisor
Upington SEF, Northern Cape	Abengoa Solar	Environmental Advisor
Ofir-ZX PV SEF near Keimoes, Northern Cape	Networx S28 Energy	Environmental Advisor

Due Diligence Reporting

Project Name & Location	Client Name	Role
5 PV SEF projects in Lephalale, Limpopo	iNca Energy	Environmental Advisor
Prieska PV Plant, Northern Cape	SunEdison Energy India	Environmental Advisor
Sirius Phase One PV Facility near Upington, Northern Cape	Aurora Power Solutions	Environmental Advisor

RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the !Khi CSP Facility, Northern Cape	Abengoa Solar	Project Manager
ECO for the construction of the Ilanga CSP 1 Facility near Upington, Northern Cape	Karoshoek Solar One	Project Manager

Project Name & Location	Client Name	Role
ECO for the construction of the folar Park, Northern Cape	Kathu Solar	Project Manager
ECO for the construction of the KaXu! CSP Facility, Northern Cape	Abengoa Solar	Project Manager
Internal audit of compliance with the conditions of the IWUL issued to the Karoshoek Solar One CSP Facility, Northern Cape	Karoshoek Solar One	Project Manager

Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Environmental Advisor
Ilangalethu CSP 2, Northern Cape	FG Emvelo	Environmental Advisor
Kathu CSP Facility, Northern Cape	GDF Suez	Environmental Advisor
Lephalale SEF, Limpopo	Cennergi	Environmental Advisor
Solis I CSP Facility, Northern Cape	Brightsource	Environmental Advisor

RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager
ECO for the construction of the Gouda WEF, Western Cape	Blue Falcon	Project Manager
EO for the Dassiesklip Wind Energy Facility, Western Cape	Group 5	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Gouda Wind Energy facility near Gouda, Western Cape	Blue Falcon	Project Manager
Annual auditing of compliance with all environmental licenses for the operation activities at the West Coast One Wind Energy facility near Vredenburg, Western Cape	Aurora Wind Power	Project Manager
External environmental and social audit for the Amakhala Wind Farm, Eastern Cape	Cennergi	Project Manager
External environmental and social audit for the Tsitsikamma Wind Farm, Eastern Cape	Cennergi	Project Manager
ECO for the construction of the Excelsior Wind Farm and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
External compliance audit of the Dassiesklip Wind Energy Facility, Western Cape	BioTherm Energy	Project Manager

Compliance Advice

Project Name & Location	Client Name	Role
Amakhala Phase 1 WEF, Eastern Cape	Cennergi	Environmental Advisor
Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Environmental Advisor
Excelsior Wind Farm, Western Cape	BioTherm Energy	Environmental Advisor

Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Hopefield Community WEF, Western Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Rheboksfontein WEF, Western Cape	Moyeng Energy	Environmental Advisor
Tiqua WEF, Western Cape	Cennergi	Environmental Advisor
Tsitsikamma WEF, Eastern Cape	Cennergi	Environmental Advisor
West Coast One WEF, Western Cape	Moyeng Energy	Environmental Advisor

Due Diligence Reporting

Project Name & Location	Client Name	Role
Witteberg WEF, Western Cape	EDPR Renewables	Environmental Advisor
IPD Vredenburg WEF within the Saldanha Bay area, Western Cape	IL&FS Energy Development Company	Environmental Advisor

CONVENTIONAL POWER GENERATION PROJECTS (COAL)

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the Camden Power Station, Mpumalanga	Eskom Holdings	Project Manager

Compliance Advice

Project Name & Location	Client Name	Role
Thabametsi IPP Coal-fired Power Station, near Lephalale, Limpopo	Axia	Environmental Advisor

GRID INFRASTRUCTURE PROJECTS

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Ferrum-Mookodi Transmission Line, Northern Cape and North West	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section A Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section B Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Hydra IPP Integration project, Northern Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Kappa-Sterrekus Section C Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Namaqualand Strengthening project in Port Nolloth, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
ECO for the construction of the Neptune Substation Soil Erosion Mitigation Project, Eastern Cape	Eskom	Project Manager
ECO for the construction of the Ilanga-Gordonia 132kV power line, Northern Cape	Karoshoek Solar One	Project Manager

MINING SECTOR PROJECTS

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Duhva Mine Water Recovery Project, Mpumalanga	Eskom Holdings SoC Limited	Project Manager
External compliance audit of Palesa Coal Mine's Integrated Water Use License (IWUL), near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Palesa Coal Mine's Waste Management License (WML) and EMP, near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Mbali Coal Mine's Integrated Water Use License (IWUL), near Ogies, Mpumalanga	HCI Coal	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mining Operations (Brand se Baai), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mineral Separation Plant (MSP), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Smelter Operations (Saldanha), Western Cape	Tronox Namakwa Sands	Project Manager
Compliance Auditing of the Waste Management Licence for the PetroSA Landfill Site at the GTL Refinery, Western Cape	PetroSA	Project Manager

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Olifants River Water Resources Development Project (ORWRDP) Phase 2A: De Hoop Dam, R555 realignment and housing infrastructure	Department of Water and Sanitation	Project Manager Auditor
ECO for the Rehabilitation of the Blaaupan & Storm Water Channel, Gauteng	Airports Company of South Africa (ACSA)	Project Manager
Due Diligence reporting for the Better Fuel Pyrolysis Facility, Gauteng	Better Fuels	Project Manager
ECO for the Construction of the Water Pipeline from Kendal Power Station to Kendal Pump Station, Mpumalanga	Transnet	Project Manager
ECO for the Replacement of Low-Level Bridge, Demolition and Removal of Artificial Pong, and Reinforcement the Banks of the Crocodile River at the Construction at Walter Sisulu National Botanical Gardens, Gauteng Province	South African National Biodiversity Institute (SANBI)	Project Manager
External Compliance Audit of the Air Emission Licence (AEL) for a depot in Bloemfontein, Free State Province and in Tzaneen, Mpumalanga Province	PetroSA	Project Manager

HOUSING AND URBAN PROJECTS

Compliance Advice and reporting

Project Name & Location	Client Name	Role
Kampi ya Thude at the Olifants West Game Reserve, Limpopo	Nick Elliot	Environmental Advisor
External Compliance Audit of WUL for the Johannesburg Country Club, Gauteng	Johannesburg Country Club	Project Manager

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Due Diligence Audit for the Due Diligence Audit Report, Gauteng	Delta BEC (on behalf of Johannesburg Development Agency (JDA))	Project Manager

1st Floor, Block 2, 5 Woodlands Drive Office Park
Woodlands Drive, Woodmead
Johannesburg, South Africa

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Tel: +27 (11) 656 3237

CURRICULUM VITAE OF LISA OPPERMAN

Profession : Environmental Assessment Practitioner and GIS Consultant

Specialisation: Environmental Impact Assessments, Basic Assessments, Site Screening and Site Selection reporting, compilation of maps through the use of ArcGIS

Work Experience: 3 years of experience in the environmental management and GIS field

VOCATIONAL EXPERIENCE

Lisa Opperman has three years of experience in the environmental field. She has worked on a variety of EIA processes including renewable energy projects, as well as industrial developments. She has also been involved in the undertaking of public participation for projects located in South Africa which has included the undertaking of public meetings, focus group meetings and key stakeholder meetings in both Afrikaans and English. She also has experience in working with ArcGIS 10 for the compilation of maps, the manipulation of data and screening for environmental sensitivities within areas with the potential for development.

SKILLS BASE AND CORE COMPETENCIES

- GIS Mapping
- EIA Report Writing
- Conducting of public involvement processes
- Administrative tasks
- Analysis and manipulation of geographical information and technical experience with the use of ArcGIS

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons) Environmental Management (2014), North-West University, Potchefstroom
- B.A Psychology, Geography and Environmental Studies (2013), North-West University, Potchefstroom

Courses:

- Environmental Legal Compliance and Auditing (2017), Janice Tooley at the Protea Hotel OR Thambo, Johannesburg

EMPLOYMENT

Date	Company	Roles and Responsibilities
February 2015 – current	Savannah Environmental (Pty) Ltd	Environmental Assessment Practitioner and GIS Consultant *Tasks include: Compilation of Environmental Scoping Reports, Plan of Study, Environmental Impact Assessment Reports, Basic Assessments and Environmental management programmes; Environmental Screening Reports; Specialist management; project proposals and tenders; Client liaison and Marketing; Process EIA Applications, GIS Mapping and data analysis and manipulation*

PROJECT EXPERIENCE

Renewable Power Generation Projects: Solar Energy Facilities

Screening Studies

Project Name & Location	*Client Name*	*Role*
Pre-feasibility Desktop Screening and Fatal Flaw Scan for a Solar PV Project near Lichtenburg, North West Province	*ABO Wind AG*	*EAP and GIS Consultant*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	*Client Name*	*Role*
Buffels PV 1 & Buffels PV 2 Solar Energy Facilities near Orkney, North West	*Kabi Solar*	*EAP and GIS Consultant*
Woodhouse Solar 1 & Woodhouse Solar 2 PV Facilities near Vryburg, North West	*Genesis Eco-Energy Developments*	*EAP and GIS Consultant*
Orkney Solar Farm, North West	*Genesis Eco-Energy Developments*	*EAP and GIS Consultant*
Tewa Isitha Solar 1 & Tewa Isitha Solar 2 PV facilities near Upington, Northern Cape	*AfriCoast Energy*	*EAP and GIS Consultant*

Basic Assessments

Project Name & Location	*Client Name*	*Role*
Harmony Gold 3x PV Facilities, Welkom, Free State	*BBEntropie*	*EAP and GIS Consultant*

Renewable power generation projects: Wind Energy Facilities

Screening Studies

Project Name & Location	*Client Name*	*Role*
Juno Wind Farm Screening Assessment Report near Lamberts Bay, Western Cape Province	*AMDA Developments*	*EAP and GIS Consultant*

Lamberts Bay Wind Farm Screening Assessment Report near Lamberts Bay, Western Cape Province	*Windy World*	*EAP and GIS Consultant*
Pre-feasibility Desktop Screening and Fatal Flaw Scan for the Kudusberg and Rondekop Wind Energy Facilities, Northern Cape and Western Cape Provinces	*ABO Wind AG*	*EAP and GIS Consultant*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Boulders Wind Farm, Western Cape Province	*Vredenburg Windfarm*	*EAP and GIS Consultant*
Namas Wind Farm, Northern Cape Province	*Genesis Namas Wind (Pty) Ltd*	*EAP and GIS Consultant*
Zonnequa Wind Farm, Northern Cape Province	*Genesis Zonnequa Wind (Pty) Ltd*	*EAP and GIS Consultant*

Grid Infrastructure Projects

Basic Assessments

Project Name & Location	***Client Name***	***Role***
132/11kV Olifantshoek Substation and Power Line, Northern Cape	*Eskom*	*EAP and GIS Consultant*

Gas Projects

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Richards Bay Combined Cycle Power Plant (CCPP) power plant, KwaZulu-Natal	*Eskom*	*EAP and GIS Consultant*

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Neopak Combined Heat and Power (CHP) Plant, Rosslyn, Gauteng	*Neopak*	*EAP, Public Participation and GIS Consultant*

Screening Studies

Project Name & Location	***Client Name***	***Role***
Richards Bay Combined Cycle Power Plant (CCPP) power plant, near Richards Bay, KwaZulu-Natal	*Eskom*	*EAP and GIS Consultant*

Infrastructure Development Projects (bridges, pipelines, roads, etc)

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Water Treatment Plant at the Neopak Facility, Rosslyn, Gauteng	*Neopak*	*EAP, Public Participation and GIS Consultant*

Housing and Urban Projects

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***

Metals Industrial Cluster near Kuruman, Northern Cape	*Northern Cape Department of Economic Development and Tourism*	*EAP and GIS Consultant*

Environmental Management Tools

Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Environmental Management Programme (EMPr) for the Nxuba Wind Farm, Eastern Cape	*ACED*	*EAP*
Operation Environmental Management Programme (EMPr) for Phase 1 of the Amakhala Emoyeni Wind Energy Facility, Eastern Cape	*Cennergi*	*EAP*
Operation Environmental Management Programme (EMPr) for the Tsitsikamma Community Wind Energy Facility, Eastern Cape Province	*Cennergi*	*EAP*
Environmental Management Programme (EMPr) for the Skuitdrift 1 Solar PV Energy Facility near Augrabies, Northern Cape Province	*Building Energy South Africa*	*EAP and GIS Consultant*
Environmental Management Programme (EMPr) for the Skuitdrift 2 Solar PV Energy Facility near Augrabies, Northern Cape Province	*Building Energy South Africa*	*EAP and GIS Consultant*