

ENVIRONMENTAL MANAGEMENT PROGRAMME

FOR THE

**THE DEVELOPMENT AND EXPANSION OF SOLAR PHOTOVOLTAIC FACILITIES IN
AREAS OF LOW OR MEDIUM ENVIRONMENTAL SENSITIVITY**

FOR THE

300MW PHOTOVOLTAIC ELECTRICITY GENERATION FACILITY

ON

**PORTIONS 3 AND 8 (POWERLINE) AND 12 OF FARM 187 OLYVENKOLK,
KENHARDT DISTRICT**

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CHAPTER 1

Executive Summary

This EMP has been prepared in terms of the Norm for the Exclusion of the Development and Expansion of Solar Photovoltaic Facilities in Areas of Low or Medium Environmental Sensitivity, in terms of section 24(10) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and exclude, in terms of section 24(2)(d) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) activities identified in terms of section 24(2)(a) and (b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) for the development and expansion of solar photovoltaic facilities, including any associated activity or infrastructure.

The EMP must be included as part of all contract documentation for all contractors in the construction phase of the development.

The Author

Enviro-EAP (Pty) Ltd is an independent consulting company and has no interest in any business related to the development site, nor will it receive any payment or benefit other than fair remuneration for the task undertaken, as required in terms of the NEMA Regulations.

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Natural Scientific Professions Act, 2003 (Act 27 of 2003), as a Professional Natural Scientist (Ecological Science) Registration Number: 4008274/11. He further qualified in Environmental Management Systems ISO 14001:2004, at the Centre for Environmental Management, North-West University, as well as Environmental Management Systems ISO 14001:2004 Audit: Internal Auditors Course to ISO 19011:2003 level, from the Centre for Environmental Management, North-West University qualifying him to execute audits to ISO/SANS environmental compliance and EMS standards.

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- An Overview of Environmental Management at the Local Government Level, Centre for Environmental Management, North-West University;
- Greener Governance for Local Authorities, Centre for Environmental Management, North-West University;
- Tools for Integrated Environmental Management and Governance, Centre for Environmental Management, North-West University.

He further attended and obtained a certificate on Integrated Protected Area Planning at the Centre for Environmental Development, University of Kwa Zulu Natal and a certificate in Project Management (Theory and Practical), through CS Holdings. Nicolaas has lectured in two subjects at the Cape Peninsula University of Technology. He has 33 years of environmental planning experience, working for Free State and Western Cape departments of environmental affairs, where he reviewed and commented on development (EIA) applications, in the West Coast Region.

He has, as practising EAP been responsible for many environmental impact assessments and EIA applications, waste license and atmospheric emission license applications.

He has also been involved in the implementation of several environmental management systems. He has engaged successfully with various clients as set out below.

Project Description

The construction of the 300 MW Photovoltaic Electricity Generation and 132 kV power line on Portion 8 and 3 of Farm Olyvenkolk, located approximately 37km southwest of the town of Kenhardt in the Northern Cape Province. The infrastructure associated with this facility includes:

- Solar panels arranged in units with a generating capacity of approximately 300 MW and a total footprint of approximately 426ha.
- A 132 kV power line (mono pole structures) of approximately 12 km over Portions 8 and 3 of Farm 187 to feed the electricity generated into the existing Aries substation.
- Expansion of the Aries substation to receive the generated electricity into the ESKOM grid; and
- Ancillary infrastructure such as inverters and transformers, conductors (cables), a central bushbar, isolators, switch gear, protection infrastructure, measurement devices and maintenance facility and security and control room
- One substation of 80x50m.
- One Lithium Ion Battery Energy Storage Systems (BESS) of approximately 2.6ha.

The modules would be mounted on a table array with or without a single axis tracking system anchored to the ground utilising rammed or planted steel support posts. A concrete foot piece secured to a steel pen driven into the ground would be used where ramming does not prove feasible. The maximum height of the solar array tables in

operation would be approximately 5 m and would allow sufficient ground clearance for the free flow of surface water underneath the panels. The solar panels may be equipped with sun-trackers. The facility and associated infrastructure will be accessed via existing access road. A 4m management track will surround each block of photovoltaic arrays, totalling approximately 5km of gravel road. These single-track management roads will be used as access roads to service and maintain structures and to serve as fire breaks. On full commissioning of the facility, any access points to the site which are not required during operational phase will be closed and rehabilitated.

Solar PV technology is a method of generating electrical power by converting solar radiation using semiconductors through a process known as the photovoltaic effect. It is not the heat required from the sun but the amount of irradiation available that allows for electrical energy to be generated. The proposed PV Plant can utilise two (2) types of PV Panel technology, Polycrystalline (c-Si) technology and Bifacial technology. c-Si Technology is essentially crystalline silicon cells which are connected and compressed between a transparent layer and a backing material. The Bifacial technology produce solar power from both sides of the panel. Both PV Panel technologies have the same components which consist of the following:

- PV Cell: A basic PV device, which generates electricity when exposed to solar radiation. All PV cells produce Direct Current (DC) electricity;
- PV Module or Panel: The smallest complete assembly of interconnected PV cells. The modules are typically mounted in a lightweight aluminium frame to form a panel.
- PV Array: A group of PV panels connected together is termed as PV Array. An interconnected system of PV modules that function as a single electricity producing unit. The proposed PV panels are approximately 2.3 m in height and 1.3m in width. These panels will be installed on single axis tracking mounting structures.
- Mounting Structure: The single axis tracking mounting structure is approx. 4.5 m in height. Total height is approx. 5m depending on the specific ground clearance allowed below the structure. The mounting structure is supported by soundly secured steel posts, planted in the ground, providing structural support for the PV array. Each PV Array table is approximately 12m in length and 4.5m. The array tables are arranged in series to make a Solar Array table row. The total length of each row depends on site geometry but typically varies from 260-360m on this site. The rows are then arranged in a matrix throughout the Solar field with all energy generated being consolidated at the electrical reticulation points.
- Inverter Cabins: The electricity generated from the solar panels will be transferred via combiner boxes to the inverters. These combiner boxes combine several cables that come from each string of modules into a unique pair of DC cables that is then connected to the inverter. Wiring to Inverters/Transformers Array enclosures are wired to inverters, where DC is converted to Alternating Current (AC). The inverters function to convert DC electricity to AC electricity at grid frequency. The voltage is then stepped-up via transformers to be distributed via the power station grid.
- Lithium Ion Battery Energy Storage Systems (BESS). Lithium Ion batteries are solid state batteries that consist of multiple battery cells that are assembled together to form modules. Each cell contains a positive electrode, a negative electrode and an electrolyte. A module may consist of several cells working in conjunction. The negative electrode for lithium-ion cell is typically carbon. The positive electrode can be lithium iron phosphate or a lithium metal oxide. The electrolyte is usually a lithium salt dissolved in an organic solvent. The BESS will

be located in approx. 100 steel containers of approx. individual dimensions (12m length x 3m width x 3m height) and will be located in a total area of approx. 2.6 hectares within the designated area, adjacent to the electrical reticulation area.

The proposed development will be constructed closer than 32 meters and in some places through watercourses. The electricity cable connecting the panels to each other, the distribution network will be laid underground and access roads will be constructed through some of the drainage lines.

The facility and associated infrastructure will be accessed using existing farm road with direct access off the Kenhardt to Pofadder gravel road. The facility will be authorized in terms of Section 21 of the National Water Act water use.

Background to Solar Electricity Generation Facilities

The Renewable Energy Feed-in Tariff Process (criteria not yet finalised by the National Energy Regulator of South Africa), selection process, IRP from government, and the economics of the solar plant will be key in determining the final technology combination and the schedule of implementation for the facility.

The overarching objective for the solar facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. In order to try meeting these objectives local level environmental and planning issues will be assessed through a site-specific assessment during the EIA Phase in order to delineate areas of sensitivity within the broader site. This will serve to inform the design of the facility.

Solar Photovoltaic Panels make use of the semi-conductor characteristics of Silicon to convert Solar Irradiation (sunlight) directly into electricity.

This technology is proven and has been used both in photovoltaic applications as well as the electronic industry for the last 40 years, with major improvements in both reliability and cost, resulting from large scale application especially in the computer industry over the last 20 years.

The Silicon is typically deposited in thin layers and sandwiched between two protective plate safety glass sheets. This forms a typical Solar Photovoltaic panel as shown in figure below.



Figure 1. Close up of a Solar Photovoltaic Panel

For large scale installations, these panels are typically arranged in arrays arranged in a grid formation in an open field arrangement where maximum sunlight can be harvested.

Shown below in Figures 2 and 3 are two typical examples of solar arrays similar to that planned for this project. The panels are attached to mounting frames and located close to the ground at a fixed inclination angle to maximise daily sunlight.



Figure 2. Large scale Solar PV array



Figure 3. Aerial view of large scale Solar PV array

Solar Photovoltaic is the most reliable of all the renewable energy technologies available for producing electricity. It is the only solid state technology i.e. that directly converts sunlight into electricity. All other renewable technologies, including Wind, Biomass and other Solar technologies are indirect technologies which first have to convert sunlight to thermal or mechanical energy prior to producing electricity.

Solar PV is also the most environmental friendly of the renewable energy technologies.

Unobtrusive due to its close proximity to the ground, it also is completely quiet due to no moving parts within the system. It uses no water, produces no effluent and has no irreversible impact on soil utilisation after decommissioning.

Several disadvantages which are prevalent in all other forms of renewable energy generation are absent from a Solar PV installation.

Several other technologies exist for converting Solar Energy into electricity. Most are however in the very early stages of commercial exploitation and do not have the successful track record associated with Solar PV.

Photovoltaic Arrays

An individual PV module is made of layers of amorphous silicone, which acts as a semi-conductor. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. Higher light intensity will increase the flow of electricity. This charge is discharged *via* the module's transparent conductive front layer and metallic rear layer. The direct current generated within the module is fed into the electrical grid *via* an inverter (Figure 4 and Figure 5).

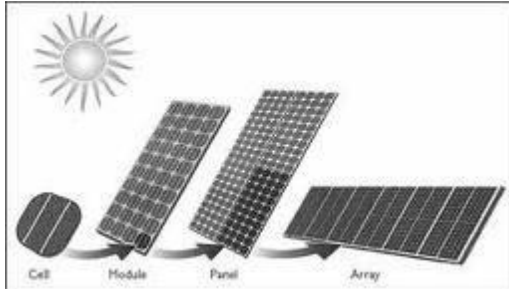


Figure 4. Solar Array

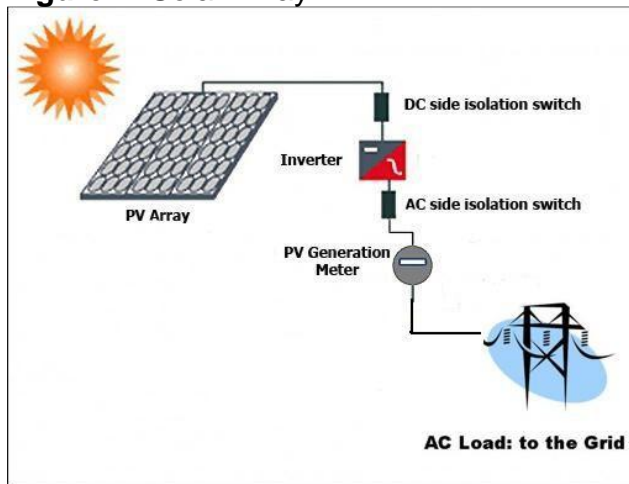


Figure 5: Schematic showing solar energy capture and electricity generation.

The proposed thin-film PV modules are 1.9m² (0.99m x 1.96m) in size, and comprise four panels. Each module is mounted on a metal supporting structure, no more than 1.8m off the ground, and has a potential output of 380W. There are a number of options regarding the structures and their anchoring to the ground. Typically this is done by means of a small concrete “foot” at the base of the pole supporting the structure. This facility will make use of a specially designed metal ground screw that will be screwed into the ground and the support structure will then be bolted onto it.

Construction phase

(a) Conduct surveys

Prior to construction, surveys such as, but not limited to, geotechnical, site surveys and confirmation of PV array micro-siting, road servitudes, etc. must be conducted.

(b) Establish access roads

Access to site is via the Pofadder gravel road. Within the site itself, access will be required from the existing roads to the individual facility components for construction purposes (and later limited access for maintenance).

(c) Site preparation

This will include clearance of vegetation at all the roads and building footprints. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

(d) Establishment of laydown areas

Laydown and storage areas will be required for the construction equipment required on site.

(e) Establishment of ancillary infrastructure

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

(f) Undertake site remediation

Once construction is completed and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and rehabilitated.

(g) Contouring

Natural contouring must be used when constructing the facility. This enables limited artificial contouring to be used.

The facility will be constructed north east of the Aries ESKOM Substation southwest of the town Kenhardt, Northern Cape on Portion 12, 8 and 3 of Farm 187 Olyvenkolk. The property where the facility is proposed covers a total area of approximately 426 ha, the extent of which is larger than the space required for the facility's developmental footprint of 1186ha.

The site falls within the quarter degree grid 2920BD. GPS readings as per Google - 29° 26' 18"S and 20° 48' 50"E.

The study site is situated approximately 37km southwest of Kenhardt, north east of the Aries Eskom substation. The study area is south of the gravel road from Kenhardt to Pofadder. The gravel road turns west of the R27 south of the town Kenhardt. The Sishen Saldanha railway line runs over the southern portion of the study site.

investigated and will be implemented if feasible. Water usage is minimal. An onsite maintenance facility will be used as a repair base and storage of maintenance equipment. Grounds will be maintained. All waste generated will be transported weekly or when required to the Kenhardt waste managing facilities.

Decommissioning phase

The PV is expected to have a lifespan of approximately 30 years (with maintenance). The infrastructure would only be decommissioned once it has reached the end of its economic life. If economically feasible, the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at the time. However, if not deemed so, then the facility would be completely decommissioned which would include the following decommissioning activities.

(a) Site preparation

Activities would include confirming the integrity of the access to the site to accommodate the required equipment and the mobilisation of decommissioning equipment.

(b) Disassemble and replace existing components

The components would be disassembled and reused and recycled or disposed of in accordance with regulatory requirements.

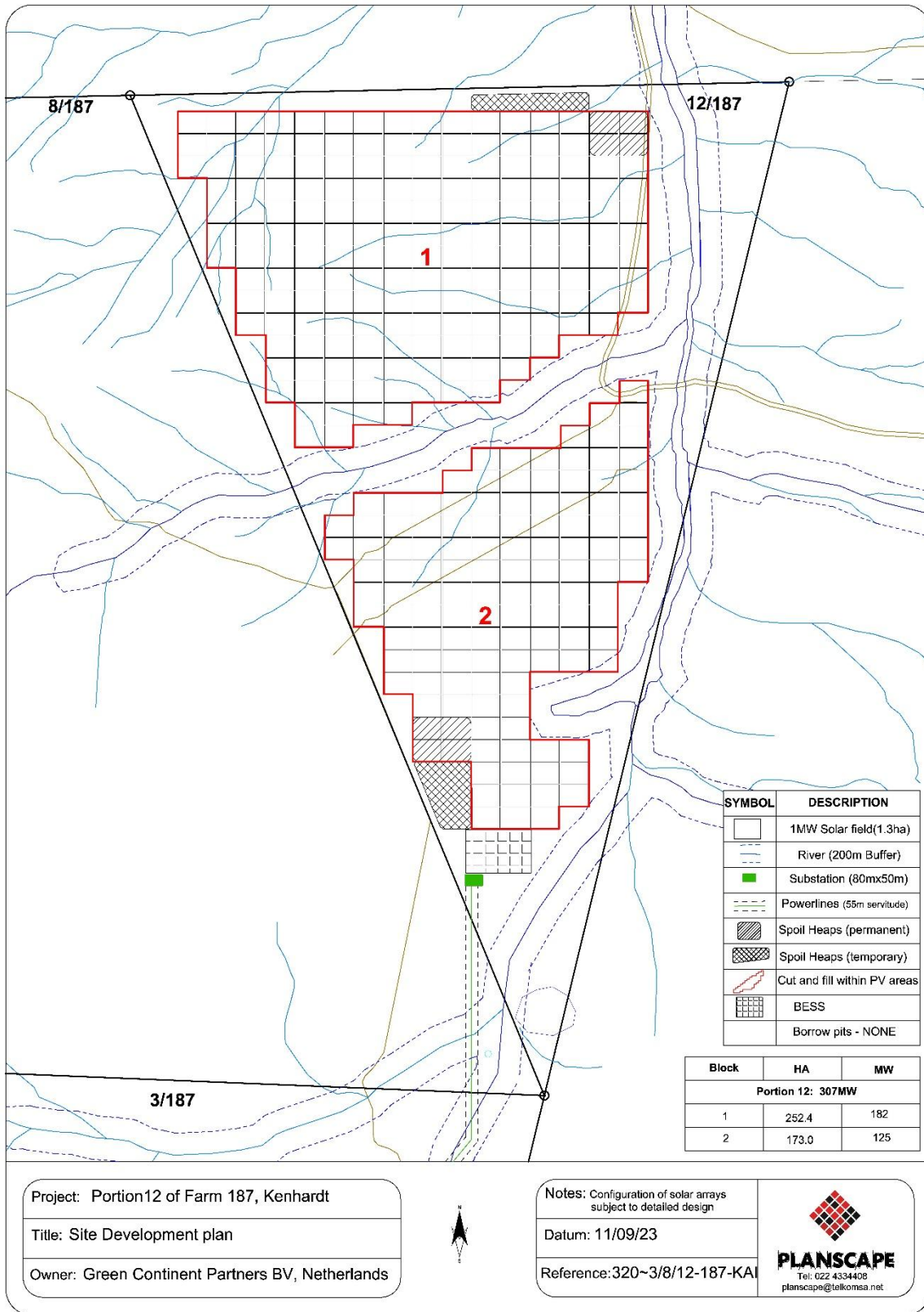


Figure 7: Solar PV registration areas indicated in Site Development Plan.

CHAPTER 2

2.1 Monitoring and Auditing

2.1.1 Introduction

In keeping with current environmental and associated legislation, all environmental management procedures and actions must be reviewed and refined on an ongoing basis.

This is in accordance with the dynamic nature of environmental management and allows for the timeous identification and mitigation of issues as they come to light.

The process of review and refinement, built into the requirements of the EMP, is known as monitoring and auditing.

2.1.2. Roles and Responsibilities

Efficient implementation of the performance specifications, effective monitoring and auditing, as well as clear responsibility and accountability allocation requires that various role-players be defined for the construction implementation project.

Depending on the nature and scale of a project, implementing teams could be composed of any number of role-players, each with their own specified responsibilities.

Therefore, for the purpose of this document, the following role-players are defined, based purely on responsibility and accountability allocation. The actual designation of role-players may vary, but the responsibilities will largely remain as stated.

2.1.2.1. Developer/landowner or custodian of the land

The developer/landowner or custodian of the land is the person or organization with decision making capacity for the land in question, and thus ultimately accountable for what takes place on that land.

2.1.2.2. Contractor

Contractors are appointed to undertake the works as specified in the contract. It is the responsibility of the contractor to do whatever is necessary from their side to ensure that he or an appointed advisor is well versed in environmental studies, so that they may accurately and efficiently carry out the requirements of the environmental specification.

The contractor is liable for any and all remedial work required in terms of the environmental specification, resulting from his environmental negligence, mismanagement and / or non-compliance.

2.1.2.3. Environmental Control Officer

An environmental control officer will manage and undertake monthly environmental inspections for the duration of the construction phase of the project as required.

The contractors or line management are answerable to the ECO for non-compliance. Issues of non-compliance raised by the ECO/EO must be taken up by the project manager, and resolved as per the conditions of his contract.

Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation and not allowed for in the performance specification) must be endorsed by the project manager.

2.2 The Monitoring Procedure

Environmental monitoring is the continuous evaluation of the status and condition of environmental elements. Its purpose is to detect change that takes place in the environment over time and involves the measuring and recording of physical, social and economic variables associated with development impacts.

Many techniques for environmental monitoring have been proposed, each detailing a specific protocol. Regardless of which technique is used, the ultimate aim is that each environmental management specification be checked by means of a system in which a score may be allocated for:

- Full compliance;
- Satisfactory performance;
- Unsatisfactory performance and
- No action taken.

Completed monitoring reports will be submitted to the developer/landowner and the contractor, who will attend to issues. These reports must be kept on file and be made available upon request by any environmental authority requesting such.

All persons employed, the contractor or his sub-contractors, must abide by the requirements of these performance specifications as they apply to the works. Any employees, the contractor or his sub-contractors found to be in breach of any of the environmental specifications, may be ordered to vacate the site forthwith and/or be subject to a disciplinary process.

The order may be given orally or in writing by the ECO. Confirmation of an oral order will be given as soon as practicable, but lack of confirmation in writing must not be a cause for the offender to remain on site, or not be subject to a disciplinary process. Supervisory staff, the contractor or his sub-contractor may not direct any person to undertake any activities which would place such person in contravention of the EMP, legislation and specifications.

The contractor and staff are deemed not to have complied with the performance specifications if:

- There is evidence of wilful or accidental contravention of any specification included in the specification;
- There is evidence of the contractor carrying out activities not permitted in terms of the EMP, contract and / or the specification;
- There is evidence of environmental negligence and / or mismanagement resulting in negative impacts on the environment;
- Has failed to meet with the requirements of the approved schedule.

The contractor and developer/landowner will be informed via ECO monthly reports, as well as by means of direct instruction (if necessary) as to what corrective actions are required in terms of environmental compliance. Disregard for an instruction, and failure to respond adequately to complaints from the public will be construed as non-compliance. Non-compliance may lead to parties being penalised.

In more serious cases, the ECO may give notice, and halt operations until such a time that the corrective action is taken and the site complies with the performance specifications.

In cases of persistent non-compliance, the contractor or staff may be evicted from site after disciplinary process is followed. Only the developer/landowner may issue such instruction, retaining any costs required to remedy situations perpetuated by environmental negligence, mismanagement and / or non-compliance.

2.3 Retentions and Penalties

It is recommended that a penalty retention system be combined with the penalty system to both motivate and compel the contractor to adhere to the EMP for the duration of the contract.

In this way incentives may be created to perform (i.e. in the form of the retention amounts that will only be paid to the contractor at the end of the contract), without creating the misunderstanding that adherence to the EMP is optional.

Persistent non-compliance will not only result in the contractor forfeiting any retention amount, but he will also be fined.

Of importance is that the contract specifies exactly how the penalty and retention system will operate, as well as how any funds resultant from retentions and penalties will be utilised.

All such funds must be used to improve environmental conditions on the site in general.

2.3.1. The Retention System

For this system, a percentage value for each of the sections priced for in the environmental bill of quantities is retained until the full completion of the contract works.

If the monitoring process reveals persistent and/or wilful non-compliance with any aspect of the environmental performance specifications, then the full retention associated with that particular item will be withheld.

The project may then apply these retained funds to rectify the problem on site possibly making use of other or alternate resources at his disposal.

At the end of the contract or action, all remaining environmental retention amounts will be paid out to the contractor or staff pending approval by the ECO, after having confirmed full compliance with the relevant performance and rehabilitation specifications.

2.3.2. Penalty System

A system of penalties will be introduced to reinforce environmentally sensitive and prudent behaviour. The maximum penalties that will be fined per incident that may be enforced are listed below. The penalty amount will be determined (inter alia) by the severity of the offence.

Offence	Amount
Non-compliance of EMP condition	R 5 000.00 (ex VAT) per non-compliant act, per day until compliance is achieved
Casual Litter on site resulting from operation	R250 / offence / day
Disposal of any litter or construction material in non-specified area or by non-compliant means	R5000 / m ³ / per day
Dumping of cement, concrete, fuel or oil in an area or other than that authorised and suitable	R10 000 per offence / day
Failure to use portable / toilets	R100 / observed incident or evidence of human excrement on site

In addition to the above, all costs incurred by the client / developer to remedy any damage will be the responsibility of the offender.

Should the monitoring process reveal acts of persistent and / or wilful non-compliance with the environmental performance specifications, then the contractor or staff member will be fined

according to the specified value of that item. The retention and penalty system should be adhered to. Should the monitoring process reveal acts of persistent and / or wilful non-compliance with the environmental performance specifications, then the contractor or staff member will be fined according to the specified value of that item. The ECO will issue the fine to the offender on which the value of the fine will be prescribed. All penalties will be paid directly to an environmental charity / NGO as identified by the ECO.

CHAPTER 3

3.1. Good Housekeeping

The developer/landowner will ensure the maintenance of “good housekeeping” practices during operations.

This will help avoid several disputes regarding responsibility and will allow for the smooth running of the operation as a whole.

Good housekeeping extends beyond the environmentally sensitive construction methods to include the care for and preservation of the surrounding environment.

3.2 Record Keeping

The developer/landowner will ensure that a filing system, identifying all documentation related to the EMP, is established.

A list of reports likely to be generated during the project is set out below.

All applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Approved EMP, authorizations, licenses or permits;
- Final design documents and diagrams issued;
- All communications detailing changes of design/scope that may have environmental implications;
- Monthly site monitoring reports;
- Complaints register;
- Environmental training manual;
- Environmental training attendance registers;
- Incident and accident reports;
- Emergency preparedness and response plans;
- Copies of all relevant environmental legislation;
- Permits and legal documents as part of emergency preparedness teams e.g. fire teams, etc.;
- Crisis communication manual;
- Disciplinary procedures;
- Monthly site meeting minutes during construction;
- All relevant permits;
- All method statements for all phases of the project.

3.3 Document Control

The developer/landowner will be responsible for establishing a procedure for document control.

The document control procedure must comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person;
- Every document must identify the person and their positions, responsible for drafting and compiling the document, for reviewing and recommending approval, and final approval of the document for distribution;

All documents must be dated, provided with a version number and reference number, filed systematically, and retained for a specified period.

The owner will ensure that documents are periodically reviewed and revised where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMP are performed. All documents will be made available to the external auditor.

3.4 Reporting Requirements

All advice and recommendations made by the ECO must with the landowner compliance be recorded on site in the site instruction book/ suitable register for his attention.

All spills will need to be documented and reported to DWS and other relevant authorities. Any event resulting in the spill or leak of fuels or any other hazardous solvents into the ground and/or water courses (e.g. that of hazardous substances used during the construction or operational phase), must be reported to all relevant authorities, including DFFE, within 14 (fourteen) days. This requirement is in terms of Section 30 (10) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) that pertains to the control of emergency incidents and should include the reporting, containment and clean-up procedure of such incident and the remediation of the affected area. All necessary documentation must be completed and submitted within the prescribed timeframes. Containment, clean-up and remediation must commence immediately in the case of NEMA Section 30 incidents.

CHAPTER 4

The developer/landowner must be responsible for regulating public access to information and compliance reporting.

The developer/landowner must respond to third party or public queries and complaints.

The developer/landowner must also be responsible for maintaining the compliance register to record complaints received and action taken.

CHAPTER 5 CONSTRUCTION SITE ESTABLISHMENT

OBJECTIVE PD1: PRE-CONDITIONS

A site meeting between the contractors and the representatives of the developer must take place at least 5 days prior to commencement of construction work to:

- Demarcate micro construction sites, services routes, access routes, working boundaries and no-go areas;
- Pre-construction evaluation and possible plant rescue operations;
- A site-specific avifaunal walk through should be conducted by a qualified specialist;
- Identification of laydown areas, roadways and infrastructure, particularly in respect of floral and faunal presence;
- Discuss methods of stockpiling (vegetation, topsoil, sub-soil, shell-grit, etc);
- Check required toilets and fire-fighting facilities to be in place;

- Discuss and agree restricted access to construction site;
- Sign the Declaration of Understanding (Contractors);
- Discuss and agree communication channels including contact details;
- Discuss and agree areas of responsibility;
- Discuss and agree the demarcation and control of construction and building sites.

Minutes of this site meeting must be kept, and are to be distributed to all parties.

The following equipment must be on every micro or sub site before any construction work is due to start:

- Sufficient and suitable chemical toilet facilities.
- Sufficient refuse bins, which are weather and wind proof, with proper lids.
- 1 x type ABC (all purpose) 12.5 kg fire extinguisher.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD2: LAYOUT PLAN CONTROLS

The contractor must ensure that a copy of the signed approved layout plan is available at the office on site at all times for inspection by the developer or his representative(s). Any variation to the approved layout plan must be submitted to the developer for signed approval and may only be implemented once the approved variation is available to the contractor and available on site at the office. The variation of changes to the layout must be approved by the competent authority as per the EA conditions. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD3: ADVERTISING

Signage related to the facility should be discrete and confined to the entrance gates. No other corporate or advertising signs should be permitted. The contractors may place no advertising material on the property unless prior formal written permission has been obtained from the relevant authorities. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD4: METHOD STATEMENTS

To ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMPr.

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 EMPr 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.

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:

- Details of the 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
- 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 (where applicable) include:

General Administration:

- Designate access road and the protocol on while roads are in use.
- 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).

Soil Management:

- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.

Water Management:

- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- Stipulate the storm water management procedures recommended in the storm water management plan.
- Ablution facilities (placement, maintenance, management and servicing).

Fire Prevention and Management:

- Fire management protocols and procedures to be put in place on site in accordance with relevant legislature.

Indigenous Fauna and Flora:

- Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).

Environmental Reporting:

- Incident and accident reporting protocol

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 rivers, streams or existing drainage systems.
- Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.

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 banded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).

Prevention of diseases:

Ensure and prevent diseases from spreading, such as HIV, TB, etc. All contract workings must have medical checks before and after construction. No worker may be allowed on site without medical surveillance checks and certificates confirming good health.

Socio-Economic Benefits:

The socio-economic benefit is job creating during construction, maintenance and operations. Of more significance is the generation of renewable energy to supply energy to and to secure and grow job opportunities in the area and grow the economy of the greater Municipal Area.

Temporary Site Closure:

All construction areas will be temporary closed and access to the areas restricted. Access control will be in place entering the farm and site. The Solar PV facility will be fenced before construction commenced.

The contractor may not commence the activity covered by the method statement until it has been approved by the 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. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD5: ENSURE THE DESIGN RESPONDS TO THE IDENTIFIED ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

All areas outside the demarcated and authorized registration area must be handled as no go and sensitive area. The powerline route must be handled as sensitive route and a suitably qualified specialist must determine the access roads and powerline pole sitings and demarcations.

Project Component/s	Access roads; Laydown areas and construction camp area.
Potential Impact	Design fails to respond optimally to the environmental consideration.
Activities/Risk Sources	Positioning of PV facility, Powerline poles and access roads.
Mitigation: Target/Objective	Ensure that the design of the PV facility and powerline responds to the identified environmental constraints and opportunities.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer	Pre-construction
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	Developer	Design phase
As far as possible, existing roads must be used.	Developer	Design phase
Develop a site-specific waste management plan for the construction phase.	Developer	Pre-construction
The holder of an environmental authorisation has the responsibility to notify the competent authority of any alienation, transfer and, change of ownership rights in the property on which the activity is to take place.	Developer	Pre-construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Developer	Pre-construction
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the DFFE	Developer	Pre-construction
Conventional galvanising of steel frames and pedestals should be applied to protect critical elements in contact with the ground from corrosion.	Developer	Design phase

Performance Indicator	Design meets objectives and does not degrade the environment.
Monitoring	Ensure that the design implemented is inside the authorized demarcated area.

OBJECTIVE PD6: ENSURE EFFECTIVE COMMUNICATION MECHANISMS WITH THE VARIOUS STAKEHOLDERS

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

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses.
Activities/Risk Sources	Activities associated with facility construction and 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 to be implemented during both the construction and operational phases of the facility. This procedure must include details of the contact person who will be receiving issues raised by I&APs, and the process that will be followed to address issues.	Developer	Pre-construction, construction and operational phase

Performance Indicator	Effective communication procedures in place.
Monitoring	An incident must be reported in the site book and monitored by the ECO.

**CONSTRUCTION AND FINALIZATION OF SOLAR PV AREAS
CIVIL CONTRACTOR**

Goals for Construction Phase

Overall Goal for Construction:

Undertake the construction of the PV facility infrastructure in a way that:

- Ensures that construction activities are properly managed in respect of the authorized and registered area as well as environmental aspects and impacts;
- Enables construction activities to be undertaken without significant disruption to other land uses in the area, in particular concerning noise impacts, dust, farming practices, traffic and road use, and effects on local residents;
- Minimises the impact on the surrounding area;
- Minimises impacts on sensitive environments;
- Minimises the impact on the heritage and historical value of the site and
- Minimises possible health impacts.

Objectives

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

OBJECTIVE C1: WORKING HOURS

Civil & Construction Sites	
Mondays to Fridays	06h00 – 19h00
Saturdays & Public Holidays	07h00 – 17h00

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as noise impacts.

Activities/Risk Sources	Activities associated with facility construction that creates disturbing noises.
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
Contractors may only be present on the site during the public time hours.	Developer and contractor	Construction phase

Performance Indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C2: SAFETY

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as crime, violence and incidents.
Activities/Risk Sources	The proposed development may result in an increase in crime levels in the surrounding community.
Mitigation: Target/Objective	To protect all involved from incidents and injury.

Mitigation: Action/Control	Responsibility	Timeframe
Telephone numbers of emergency services, including the local firefighting services, must be posted conspicuously in the contractor's office and near the telephone. No firearms are permitted on the construction site, other than those authorised by the developer for the property security service provider if needed. Notices should be displayed at all public entrances to the property, warning visitors that they are entering a construction site. Fine structures for livestock theft. Restrict movement to inside the site. Demarcate work areas which are safeguarded with a fence. Keep security control to enter and exit premises. Security lighting must be kept to the absolute minimum and be confined to only those sections of the facility that are necessary to be illuminated. No external up-lighting or flood-lighting of any part of the facility must be allowed. External, inclusive of perimeter security lighting must be by means of shielded down-lighters, minimizing light pollution beyond the extent of the area to be lit.	Contractor	Construction phase

Performance Indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C3: SPEED LIMIT

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as dust, noise and traffic accidents.
Activities/Risk Sources	Activities associated with facility construction such as transport of construction material, rubble and contractors.
Mitigation: Target/Objective	To protect all involved from incidents and injury and keep dust and noise impacts to a minimum.

Mitigation: Action/Control	Responsibility	Timeframe
For security and safety reasons the speed limit on the property for all contractors' vehicles is 30 km per hour. The contractor is responsible for ensuring that all his employees, sub-contractors and delivery vehicles adhere to this rule.	Contractor	Construction phase

Performance Indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C4: CONTRACTOR'S CAMP

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as pollution and litter as well as visual impacts.
Activities/Risk Sources	Setting up and operation of the contractor's camp must be in the registered footprint or at the farm yard.
Mitigation: Target/Objective	Construction camp must be neatly fenced and construction site must be neat and tidy. Outdoor lighting must be strictly controlled so as to prevent light pollution. All lighting must be installed at downward angles. Sources of light must as far as possible be shielded by physical barriers such as buildings or structures i.e. steel frames. Use only minimum wattage light fixtures.

Mitigation: Action/Control	Responsibility	Timeframe
The contractor's camp will be indicated by and to landowner management and the ECO on the site. The final location of the contractor's camp will be authorized by the ECO and landowner. Construction camp must be neatly fenced and construction site must be neat and tidy.	Developer / Contractor	Construction phase

Performance Indicator	Contractor's camp is neat and tidy and fenced.
Monitoring	The ECO in conjunction with the landowner will approve construction camp area. This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C5: DELIVERIES TO CONTRACTORS

Project Component/s	Access roads.
Potential Impact	Impacts on affected and surrounding landowners and land uses such as dust, noise, increased traffic, soil compaction and traffic accidents.
Activities/Risk Sources	Vehicles on site transporting material to contractors.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and surrounding land uses.

Mitigation: Action/Control	Responsibility	Timeframe
<p>Contractors will at all times be responsible for compliance by their delivery service providers as engaged. Delivery times will be limited to working times as defined in this document.</p> <p>Contractors have the responsibility of advising the property security staff of deliveries expected and to be executed. Contractors shall further ensure that drivers of service providers are informed of all procedures and restrictions e.g. which access road to use, speed limits, no-go areas, demarcated construction areas, and maximum allowed vehicle mass etc., as applicable before their first visit to site. Washing of service provider delivery vehicles and equipment will not be allowed on the property and must be carried out elsewhere.</p>	Contractor	Construction phase

Performance Indicator	Site is secure and there is no unauthorised entry. No members of the public/landowners injured.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C5: ALIEN/INVASIVE PLANTS

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Impacts on indigenous vegetation due to spreading of alien/invasive plants.
Activities/Risk Sources	Activities associated with facility construction such as the removal of vegetation and top soil.
Mitigation: Target/Objective	To prevent the spread of alien/invasive plants.

Mitigation: Action/Control	Responsibility	Timeframe
A contractor appointed by the developer shall be tasked to ensure that all weeds and alien/invasive species are removed as instructed and approved by the ECO. No on-site burying, dumping or stockpiling of any weeds and aliens or invasive species shall occur. Such should be removed from the site to a suitable dumping site from which seed cannot escape. Compliance with the Alien Invasive Plant Management Plan.	Contractor	Construction phase

Performance Indicator	All possible introduction and spreading of alien invasive plant species are controlled. Compliance with the Alien Invasive Plant Management Plan.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C6: STORM WATER MANAGEMENT

Project Component/s	Storm water; Access roads.
Potential Impact	Potential pollution of water resources and erosion. Erosion due to poor storm water management. Pooling of water / flooding in portions of the development site due to poor storm water management.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To manage storm water effectively and prevent pollution and erosion.

Mitigation: Action/Control	Responsibility	Timeframe
All roads need to be maintained and monitored and visible signs of possible erosion immediately rehabilitated. Undertake storm water management measures as required by the Storm Water Management Plan. Rehabilitate or stabilise eroded areas immediately to prevent increase in erosion.	Contractor	Construction phase

Performance Indicator	No signs of storm water pollution or accumulation that will result in a nuisance. All possible erosion impacts are controlled.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C7: ARCHAEOLOGY AND PALAEOLOGY MANAGEMENT

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	The loss of cultural or heritage resources.
Activities/Risk Sources	Activities associated with facility construction such as excavation.
Mitigation: Target/Objective	To protect and mitigate impacts on the areas heritage.

Mitigation: Action/Control	Responsibility	Timeframe
No archaeological mitigation is required prior to construction excavations commencing. No archaeological monitoring is required during the project Construction Phase. If any human burials are uncovered during the course of the development, then work in the immediate area must be stopped and the finds reported to SAHRA. Burials must not be disturbed or removed until inspected by a professional archaeologist.	Contractor	Construction phase

<p>If any of the buildings in the Uyekraal farm complex are to be reused, restored or repurposed, then a Management Plan will need to be drawn up so as to avoid insensitive adaptation and modification of the buildings.</p> <p>The Environmental Control Officer (ECO) and Contractor must inform staff of the need to watch for potential fossil occurrences. The Fossil Find Procedure (FFP) provides guidelines to be followed in the event of fossil finds in the excavations. Contractors and workers involved in excavating footings for example, must be informed of the need to watch for fossils and archaeological material, and the procedure to follow in the event of any fossils being found.</p> <p>If a significant occurrence of fossil bones is discovered a professional palaeontologist must be appointed to collect them and to record their contexts. The above recommendation must be included in the Environmental Management Plan (EMP) for the proposed development and must be monitored by the Environmental Control Officer (ECO).</p>		
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Performance Indicator	Protection of heritage resources
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C8: SERVICES

Project Component/s	PV facility and Powerline; Associated services infrastructure; Access roads.
Potential Impact	Damage/loss of services infrastructure or supply.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the surrounding land uses.

Mitigation: Action/Control	Responsibility	Timeframe
<p>Care and due cognisance must be taken of existing services, service routes and services restrictions.</p> <p>Eskom's rights and services must be acknowledged and respected at all times. Eskom shall at all times retain unobstructed access to and egress from its servitudes. Eskom's consent does not relieve the developer from obtaining the necessary statutory, land owner or municipal approvals.</p> <p>Any cost incurred by Eskom as a result of non-compliance to any relevant environmental legislation will be charged to the developer. If Eskom has to incur any expenditure in order to comply with statutory clearances or other regulations as a result of the developer's activities or because of the presence of</p>	Contractor	Construction phase

his equipment or installation within the servitude restriction area, the developer shall pay such costs to Eskom on demand.

The use of explosives of any type within 500 metres of Eskom's services shall only occur with Eskom's previous written permission. If such permission is granted the developer must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard. Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion. The measures taken shall be to Eskom's satisfaction.

Eskom shall not be liable for the death of or injury to any person or for the loss of or damage to any property whether as a result of the encroachment or of the use of the servitude area by the developer, his/her agent, contractors, employees, successors in title, and assignees. The developer indemnifies Eskom against loss, claims or damages including claims pertaining to consequential damages by third parties and whether as a result of damage to or interruption of or interference with Eskom's services or apparatus or otherwise. Eskom will not be held responsible for damage to the developer's equipment.

No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the developer must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager. Note: Where and electrical outage is required, at least fourteen work days are required to arrange it.

Eskom's rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with. Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.

<p>The clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993). Equipment shall be regarded electrically live and therefore dangerous at all times.</p> <p>In spite of the restrictions stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), as an additional safety precaution, Eskom will not approve the erection of houses, or structures occupied or frequented by human beings, under the power lines or within the servitude restriction area.</p>		
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Performance Indicator	Protection of existing services and infrastructure.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C9: ROADS

Project Component/s	Access roads.
Potential Impact	Increased traffic/congestion. Construction vehicles pose a potential risk to other road uses and the natural environment if they do not use designated routes.
Activities/Risk Sources	Deliveries and construction vehicle travelling to site and on site.
Mitigation: Target/Objective	Designation of specific routes for construction vehicles to reduce impact on the environment and other road users.

Mitigation: Action/Control	Responsibility	Timeframe
Only existing access routes to the property will be used during construction work, so as to control the movement of construction vehicles. The contractor shall ensure that access to construction sites and associated infrastructure and equipment is designated off-limits to the public at all times during construction. Traffic safety measures shall be considered in determining entry or exit points to public roads. Construction vehicles to be restricted only to demarcated footprint areas. Upgrade road signs to address the conflict that could be caused by movement. Provide transport to and from work where possible to decrease pedestrian traffic. Restrict heavy vehicles to specific hours. Erect road signs signaling times when heavy vehicles will make use of the road. Adhere to national traffic safety standards and precaution measures. During the construction phase the contractor has to provide a traffic safety awareness programme for all employees and the project team; the community and particularly kids.	Contractor	Construction phase

Performance Indicator	To minimise the impacts on road users and the environment.
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Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.
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OBJECTIVE C10: ANTI-EROSION MEASURES

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Wind/water erosion as a result of construction/operation activities.
Activities/Risk Sources	Activities associated with facility construction such as excavation, removal of vegetation etc.
Mitigation: Target/Objective	Reduce erosion by implementing anti-erosion measures.

Mitigation: Action/Control	Responsibility	Timeframe
<p>The contractor shall take all appropriate and active measures to prevent erosion, especially wind and water erosion, resulting from operations and activities, specifically of storm water control measures to the satisfaction of the ECO/ER. During construction the contractor shall protect areas susceptible to wind and water erosion, by installing all the necessary temporary and permanent works. Measures can include brush packing, anchovy net stabilisation, etc. Where required erosion protection measures must be installed. Aspects normally covered in construction contracts in terms of protection of works are standard and are not to be confused with those under environmental legislation. Ripping of compact soils when and where extensive compaction arises.</p> <p>Flattening and grading of the site should be kept to the minimum. The natural profile and shape of the site is to be maintained. Provision should be made for the rehabilitation of areas damaged by construction activities.</p> <p>Comply with Erosion Management Plan.</p>	Contractor	Construction phase

Performance Indicator	All possible erosion impacts are controlled and rehabilitated
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C11: CONSTRUCTION MATERIAL

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Visual impacts and causing a nuisance to surrounding landowners/residents.
Activities/Risk Sources	Activities associated with facility construction such as storage of construction material.
Mitigation: Target/Objective	Reduce the visual impact or nuisance to the surrounding landowners/residents.

Mitigation: Action/Control	Responsibility	Timeframe
Construction material will be stored at the contractor's camp, as well as on the construction site within the demarcated working areas at each construction point. Special permission may be obtained from the ECO/ER to store material on suitable substitute or ancillary locations should the need arise, and as communicated by the project engineer. All structures should be kept as small and low as technically possible. All painted surfaces are to use earth tones chosen for its ability to blend into the background. Security fencing should be as transparent as possible and mimic agricultural fencing found in the area. The fence should not be visually dominant over the solar arrays. The use of razor wire should be avoided. Screen planting in the form of tree lines should not be considered. Only in exceptional circumstances should vegetation screening be considered in clumps around structures to mimic farmsteads found in the region.	Contractor	Construction phase
Performance Indicator	To minimise the impact on the surround land uses and environment.	
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.	

OBJECTIVE C12: FIRES

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Uncontrolled fire on/off site, resulting in damage to the environment, property, injuries/death to personnel on site, or injuries/death to the public.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate the safety of people, property, and the environment on and off site by preventing uncontrolled fires.

Mitigation: Action/Control	Responsibility	Timeframe
No open fires will be allowed on site and adequate firefighting equipment should be available on site in good working order at all times as prescribed by the fire management protocols. Fires, inclusive of burning of waste, should not be allowed on site. Ensure staff is trained in fire drill. Comply with Fire Management Plan.	Contractor	Construction phase

Performance Indicator	No fire occurred to damage the surrounding environment and land uses and management actions are in place should a fire occur.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C13: HERBICIDES, PESTICIDES AND FERTILIZERS

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Adjacent land/property or natural environments contaminated by the application of herbicides, fertilizers and pesticides.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and surrounding land uses.

Mitigation: Action/Control	Responsibility	Timeframe
The contractor must make sure of, and allow, all legal requirements regarding herbicide application procedures. It is vital that the contractor becomes familiar with all the information detailed on every herbicide label before using it. The instructions on the label must be strictly followed throughout. The contractor shall take all necessary precautions to prevent overspray of herbicides outside of the demarcated construction areas and onto natural veld. All personnel working with any herbicide, pesticide or fertilizer must be registered and comply with the requirements set in these registrations. The contractor must put a system in place to control the use of herbicides and pesticides. All equipment associated to herbicides and pesticides must be maintained in accordance to the set standards. The disposal of all redundant and empty containers of herbicides and pesticides must be controlled and disposed of at a waste management facility licensed under the National Environmental Management: Waste Act.	Contractor	Construction phase

Performance Indicator	Herbicide, pesticides and fertilizer use is controlled to prevent impacts on the environment and surrounded land uses.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C14: MEASURES TO PROTECT HYDROLOGICAL FEATURES SUCH AS RIVERS, WETLANDS AND OTHER ENVIRONMENTAL SENSITIVE AREAS FROM CONSTRUCTION IMPACTS

Project Component/s	PV facility and Powerline; Access roads. Adjacent natural environments/features.
Potential Impact	Destruction of natural hydrological systems and the pollution of ground water resources.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and hydrological features.

Mitigation: Action/Control	Responsibility	Timeframe
No development may take place outside registered area. All spillage incidences and actions taken consequent thereto must be reported to the ECO and recorded in the site register.	Contractor	Construction phase
Performance Indicator	Impacts on hydrological features minimized and mitigated.	
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.	

OBJECTIVE C15: AN EFFECTIVE MONITORING SYSTEM TO DETECT ANY LEAKAGE OR SPILLAGE OF ALL HAZARDOUS SUBSTANCES DURING THEIR TRANSPORT, HANDLING USAGE AND STORAGE. THIS MUST INCLUDE PRECAUTIONARY MEASURES TO LIMIT THE POSSIBILITY OF OIL AND OTHER TOXIC LIQUIDS FROM ENTERING THE SOIL OR STORM WATER SYSTEMS

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Contamination of soil, storm water and ground water resources by hazardous substances.
Activities/Risk Sources	The handling, storage and use of hazardous substances.
Mitigation: Target/Objective	Prevention and mitigation of the environment contaminated as a result of exposure to hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
The EA holder, Land Owner, Site Environmental Officer and Environmental Control officer will do daily, weekly and monthly inspections and report and monitor compliance with the management actions included in the EMPr. These monitoring and reporting requirements are recorded in several sections of the EMPr. Monitoring will focus on signs of spillages and procedures during handling and storage of dangerous goods as described in the EMPr. The section on storage and handling of dangerous goods in the EMPr will be enforced.	Contractor	Construction phase

Performance Indicator	Impacts on soil and hydrological features minimized and mitigated.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C16: DIESEL FUEL AND LUBRICANT HANDLING PROGRAMME

Project Component/s	PV facility and Powerline; Access roads.
Potential Impact	Contamination of soil, storm and ground water resources as a result of an oil/diesel/lubricant spill/leak.
Activities/Risk Sources	Diesel fuel and lubricant use and storage.
Mitigation: Target/Objective	To protect and mitigate impacts of contaminants on the environment and hydrological features.

Mitigation: Action/Control	Responsibility	Timeframe
<p>Servicing of construction vehicles and machinery to take place of site. All vehicles must be in a good condition with no leakages leading to possible contamination of soil or water supplies. The following conditions related to the temporary fuel tanks must be implemented:</p> <p>The fuel tanks must be designed and installed in accordance with relevant Oil Industry standards and SANS codes where applicable for the aboveground storage tanks. The tanks must be located within a bund (110 % of the tanks capacity) in order to contain potential spills.</p> <p>During fuel tanker delivery, the tanker driver must be present at all times during product offloading. Should an incident occur the supply vehicle emergency cut-off switch must be activated to immediately stop fuel delivery. Flexible hoses with dry-break couplings and emergency isolation must be used. All spillage incidences and actions taken consequent thereto must be reported to the ECO and recorded in the site register.</p> <p>All fuel and flammable liquids should be stored under secure and fenced conditions and in a bunded site with the volume of the bunding capable of holding 110% of the liquid. Double bunded tanks, with leak monitoring sensors should be used.</p> <p>The applicant must ensure that effective stock inventory monitoring and regular auditing take place for the early identification of possible leaks.</p> <p>The requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), must be adhered to. Within three months of the tanks ceasing to be used the tanks must be removed at the expense of the applicant, and the site, including all associated infrastructure must be rehabilitated to the satisfaction of the relevant authority.</p> <p>Refuelling: Refuelling of equipment must be conducted from the bunded fuel tank and pump at the contractor's camp. Fuel tanks must be bunded and supplied with a concrete apron. The concreted refuelling apron will be constructed with a drain along its extremities to collect any diesel contaminated run-off and channel it to the oil trap where separated oil will be collected and disposed of in the oil recycling container and process. Any spills on the concrete apron or floor below the tank are to be treated with OT8 or Spillsolve or equivalent as per the product instructions. A 500-litre drawn trailer to convey diesel to the equipment for re-fuelling may also be used. Such</p>	Contractor	Construction phase

<p>trailer will be drawn by a specified vehicle and driver, with alternate nominated as approved by the Project Engineer. Such tow vehicle may travel at 20kms per hour maximum at any time, be clearly identifiable as such, and may only tow the diesel cart should the prerequisite drip trays and emergency equipment be on the vehicle at the time. In situ refuelling activity may only take place during a standard specified daily time slot as displayed in the construction office, unless specific per day permission has been given to refuel at any other time by the ECO. This must be pre-recorded in the site record book. Staff will require instruction in the identification of diesel and oil leaks and the use of Spillsolve (or equivalent) products.</p> <p>On-site emergency repairs: Only small mobile plant and emergency repairs are to take place on site. These will require the provision of drip trays and funnels to ensure that no oil or fuel leakages occur onto the ground. Should such spill take place, then the oil saturated soil is to be placed in suitable containers and disposed of at a hazardous waste disposal site. Any contamination of soil is to be treated with Spillsolve or similar product. Contaminated water as a result of an oil or fuel spillage on the area should similarly be treated in appropriate way, and the polluted water should not be specifically removed and not allowed to merge with run-off water collected in the trap collecting all run offs from the slab.</p> <p>Collection of contaminated spares and waste oils: Contaminated spares, oil filters, gaskets, water, etc. will be collected in separate holders at the designated storage facility for disposal at a licensed H:h site. Staff will require instruction in:</p> <ul style="list-style-type: none"> • Deleterious effects of oil / fuel on the environment • Identification of oil leaks • Handling of oil / fuel leaks into soil • Location and method in storage of contaminated spares • Fire prevention and emergency drills in case of an accident 		
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Performance Indicator	Ensure that no spillages occur and if it occurs that it is handled and cleaned up.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C17: APPROPRIATE HANDLING AND STORAGE OF CHEMICALS, HAZARDOUS SUBSTANCES AND WASTE

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include will include general solid waste and liquid waste, and may include hazardous waste.

Project Component/s	Access roads; Construction camp; Storage areas.
Potential Impact	<ul style="list-style-type: none"> • Release of contaminated water from contact with spilled chemicals. • Generation of contaminated wastes from used chemical containers. • Inefficient use of resources resulting in excessive waste generation. • Litter or contamination of the site or water through poor waste management practices. • Pollution of water and soil resources.
Activities/Risk Sources	<ul style="list-style-type: none"> • Vehicles associated with site preparation and earthworks. • Packaging and other construction wastes. • Hydrocarbon use and storage. • Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	<ul style="list-style-type: none"> • To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. • Good housekeeping of chemicals and other materials on site for the duration of the construction will minimize, avoid any spillages, or other incidents. All spillages should be reported immediately. • To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. • To comply with waste management guidelines. • To minimise production of waste. • To ensure appropriate waste storage and disposal. • To avoid environmental harm from waste disposal.

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> • Implement the waste management plan during the construction phase. • The applicant, land owner and environmental control officer (ECO) must ensure that the inert waste is separated from other hazardous construction materials. • All hazardous waste should be treated and or disposed of in the correct manner. • The National Information System regulations must be adhered to and the registration and reporting of hazardous waste generated must be done online to the Integrated Pollution and Waste Information System (IPWIS) system once the stations are operational. • Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants. • Corrective action must be undertaken immediately if a complaint is received, 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 	Contractor	Construction phase

<p>practically possible and implementing preventive measures.</p> <ul style="list-style-type: none"> • Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. • Leakage of fuels must be avoided at all times and if spillage occurs, it must be remediated immediately. • 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. • Spilled cement, fly ash and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. • Please note all material used to clean hazardous material spills must be considered as hazardous waste, together with contaminated soil. Moreover, if hazardous waste is mixed with general waste, the entire content of waste must be seen as hazardous and therefore be disposed at a licenced hazardous disposal facility. • Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility. • All stored fuels to be maintained within a sealed bund and on a sealed surface. The bund must be at least 110% of the volume of the total containers. • Adjacent fuelling areas situated around fuel tanks must be provided with an impervious layer or drip trays must be used during refuelling. • Areas around fuel tanks must be appropriately banded or contained in an appropriate manner as per the requirements of SABS 089:1999 Part 1. • Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function. • Oily water from bunds at the substations must be removed from site by licensed contractors. • The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately banded, and stored in compliance with MSDS files. • The environmental officer must ensure all material data sheets of chemicals utilized on site is kept in the site office. • 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 and copies kept on site in the environmental file. • Transport of all hazardous substances must be in accordance with the relevant legislation and regulations. 		
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<ul style="list-style-type: none"> • Construction sub-contractors must provide specific detailed waste management plans to deal with all waste streams. • 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. • 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.). • Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and disposal at appropriately licensed waste disposal sites. • Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area. • Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal and copies of the safe disposal slips must be kept in the environment file on site. • 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. • An incident/complaints register must be established and maintained on-site. • The sediment control and water quality structures used on-site must be monitored and maintained in a fully operational state at all times. • An integrated waste management approach that is based on waste minimisation must be used and must incorporate reduction, recycling, re-use and disposal where appropriate • Upon the completion of construction, the area must be cleared of potentially polluting materials. • Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site. • Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management. 		
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Performance Indicator	<ul style="list-style-type: none"> • Limited chemical spills outside of designated storage areas. • No water or soil contamination by spills.
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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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. • Complaints will be investigated and, if appropriate, acted upon • Observation and supervision of waste management practices throughout construction phase. • Waste collection will be monitored on a regular basis. • Waste documentation completed. • An incident reporting system will be used to record non-conformances to the EMPr. <p>This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.</p>

OBJECTIVE C18: EFFECTIVE MANAGEMENT OF CONCRETE BATCHING AREA

Project Component/s	Concrete batching area.
Potential Impact	<ul style="list-style-type: none"> • Dust emissions. • Release of contaminated water, pollution of ground water resources. • Ground, soil pollution. • Generation of contaminated wastes from used chemical containers. • Inefficient use of resources resulting in excessive waste generation.
Activities/Risk Sources	<ul style="list-style-type: none"> • Operation of the batching area. • Packaging and other construction wastes. • Hydrocarbon use and storage. • Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	To ensure that the operation of the batching area does not cause pollution to the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> • Concrete mixing must be conducted on an impermeable surface that is bunded. • Concrete batching plants to be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised. • Access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment. • The concrete batching plant site should demonstrate good maintenance practices, 	Contractor	Construction phase

<p>including regular sweeping to prevent dust build-up.</p> <ul style="list-style-type: none"> • 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. • 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. • Use recycled/ grey water for dust suppression. • The site should be designed and constructed such that clean storm water, including roof runoff, is diverted away from contaminated areas and directed to the storm water discharge system. • Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation. • Contaminated storm water and process wastewater should be captured and recycled where possible. • Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control. • Ensure that all practicable steps are taken to minimise the adverse effect that noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms. • Where possible, waste concrete should be used for construction purposes at the batching area. • The batching area to be monitored by the ECO to ensure that the area is operating according to its environmental objectives, within legislative requirements. 		
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<p>Performance Indicator</p>	<ul style="list-style-type: none"> • No complaints regarding dust or contamination • No water or soil contamination by chemical spills/concrete • No complaints received regarding waste on site or indiscriminate dumping
<p>Monitoring</p>	<p>Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase.</p> <p>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. All registers should be kept on site and must be made available to the department on request.</p> <p>An incident reporting system will be used to record non-conformances to the EMPr.</p>

	Developer or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.
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OBJECTIVE C19: MEASURES TO PROTECT FLORA, FAUNA AND AVIFAUNA

Project Component/s	PV facility and powerline; Access roads; Adjacent natural environments/features.	
Potential Impact	Destruction of ecological functioning.	
Activities/Risk Sources	Activities associated with facility construction.	
Mitigation: Target/Objective	To protect and mitigate impacts on the environment.	
Mitigation: Action/Control	Responsibility	Timeframe
<p>Site induction and interaction on ecological aspects. Site inspection of any fauna and avifauna within the construction area during post fencing completion. Monitoring of operations, including species presence within site, mortalities and sightings. Maintenance of vegetation and avoidance of unnecessary clearance of site. Exotic weed management and erosion control measures to be implemented where applicable. No development may take place outside registered area.</p> <p>Conduct regular daily inspections of the fence line to address any animals that may be affected by the fence. Provision of critter paths within the fencing to be provided (include during design). Promote and support faunal presence and activities within the proposed PV facility.</p> <p>A site-specific avifaunal walk through should be conducted by a qualified specialist as part of the site specific EMP just prior to construction, as to ensure that no sensitive bird species have started breeding on or near the site. In such a case mitigation measure should be designed. For birds nesting during operations, a case by case basis should be followed including the application to the provincial authority for permits for any necessary nest management. Facility lighting during construction should be kept to a minimum and should make use of latest technology to ensure light disturbance is minimized. This will also reduce attraction of insects (and in return insectivorous birds) to the facility. Construct powerlines in existing and approved servitudes and routes.</p> <p>Bird monitoring is required. Bird striking's must be recorded and reflectors installed at collision zones.</p>	Contractor	Construction phase
Performance Indicator	Impacts on hydrological features minimized and mitigated.	
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.	

WASTE MANAGEMENT PLAN

Purpose

Activities associated with the construction and operation of the Project will generate various wastes which if not properly managed have the potential to impact the environment and pose a risk to public health and workers.

This Waste Management Plan (WMP) describes the actions that will be taken to reduce, segregate, collect, and dispose of wastes to avoid or minimize impacts on the environment, communities, and workers.

This WMP covers management of non-hazardous waste and hazardous wastes.

Objectives

The WMP has the following objectives:

- The management of waste is done in accordance with applicable South African laws and regulations as well as other requirements.
- Waste minimisation is incorporated into processes.
- Wastes are characterised, classified, and segregated as close to their source as practical.
- Wastes are properly handled, stored, transported and disposed of.
- Waste management is properly documented.

Philosophy

The Project has adopted a simple philosophy for waste management which places a strong emphasis on waste minimization. The principles of the waste management philosophy are as follows:

- Reduce: If generated, reduce the quantity of waste.
- Reuse: Where possible, use items for multiple use.
- Recycle: Recycle if waste generation cannot be practicably reduced
- Reclaim: Transform waste to a value-added product.
- Dispose: If materials or energy are recovered from a waste it is classified as recovery rather than disposal.

The philosophy is adopted from the early planning phases of project development.

Scope

This WMP applies to all activities associated with construction and operation of the plant, including all work sites established during construction and operations. At the time of decommissioning, a specific WMP will be prepared.

Document control

The WMP will be maintained and controlled by the responsible party.

The WMP will be reviewed every three months during the construction or sooner in the event of a significant change in activities. The WMP will be reviewed on an annual basis during operation or sooner in the event of a significant change in activities.

The WMP will be reviewed in the event of a significant change in South African regulations.

Management

This section describes the actions that will be taken to manage waste.

Overview

After waste has been generated the following management process will be implemented:

Waste Identification

Table 1 illustrates the types of waste expected during construction and operation of the project. The table is also divided into various waste streams, such as recyclable, hazardous, and non-hazardous.

Table 1: Waste Types

Waste Type	Waste Classification	Phase	Source	End use
Broken Construction Solar PV and Operation Panels	Hazardous Waste	Construction and Operation	PV Site	Recycle
Obsolete Electronics	Hazardous waste	Construction and Operation	PV Site and facilities	Recycle or Dispose via Outside Contractor
Sewerage	Hazardous Waste	Construction and Operation	PV Site and facilities	Collected and disposed at Kenhardt WWTW.
Medical Waste	Hazardous	Construction and Operation	PV Site and facilities	Collected, treated and disposed by outside contractor
Scrap Iron and Steel	Recyclable waste	Construction	PV Site and facilities	Recycle
Copper Wire	Recyclable waste	Construction and Operation	PV Site and facilities	Recycle
Aluminum	Recyclable waste	Construction and Operation	PV Site and facilities	Recycle
Beverage containers	Recyclable waste	Construction and Operation	PV Site and facilities	Recycle
Electric Cabling and conduit	Recyclable waste	Construction and Operation	PV Site and facilities	Recycle
Clean Drums, Pails, Boxes	Reusable waste	Construction and Operation	PV Site and facilities	N/A – will be reused
Wooden Pallets	Reusable waste	Construction and Operation	PV Site and facilities	N/A – will be reused
Plastic and Glass Bottles	Reusable waste	Construction and Operation	PV Site and facilities	N/A – will be reused
Hardware (e.g., old tools, fasteners, etc.)	Reusable waste	Construction and Operation	PV Site and facilities	N/A – will be reused
Packaging Materials	Non-hazardous Waste	Construction	PV Site and facilities	Recycle or Dispose via Outside Contractor

Concrete	Non-hazardous Waste	Construction	PV Site and facilities	Dispose via Outside Contractor
Glass	Non-hazardous Waste	Construction	PV Site and facilities	Recycle or Dispose via Outside Contractor
Dried Paint containers	Non-hazardous Waste	Construction	PV Site and facilities	Dispose via Outside Contractor
Plastics	Non-hazardous Waste	Construction	PV Site and facilities	Recycle or Dispose via Outside Contractor
Food and beverage waste	Non-hazardous Waste	Construction	PV Site and facilities	Recycle or Dispose via Outside Contractor
Shredded Paper and Cardboard	Non-hazardous Waste	Construction	PV Site and facilities	Recycle or Dispose via Outside Contractor
Biomass	Non-hazardous Waste	Construction	PV Site and facilities	Use to cover bare soil areas on edge of construction area.

- ***Planning and Waste Prevention***

Opportunities to prevent the creation of waste or the type of waste generated must be identified. This could lead to a reduction in the amount of waste generated or the creation of non-hazardous waste instead of hazardous waste.

Where possible:

- Substitute inputs which are less hazardous or with those that lead to lower waste volumes;
- Institute procurement measures that recognize opportunities to return usable materials; and
- Minimize hazardous waste generation by implementing stringent waste segregation to prevent contamination.

- ***Identification of Non-Hazardous and Hazardous Waste; and Waste Handling***

Waste will be identified, classified, and managed as non-hazardous or hazardous waste.

Non-Hazardous Waste

Non-hazardous waste includes garbage and refuse. For example, domestic trash and garbage; inert construction and demolition materials; refuse, such as metal scrap and empty containers and residual waste from industrial operations.

Hazardous Waste

Hazardous waste shares the properties of a hazardous material (i.e., ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed.

Waste handling

Non-hazardous and hazardous wastes will be handled so as to reduce the risk to workers. The use of Personal Protective Equipment (PPE) is critical in the handling of various waste types. In order to protect workers from the adverse impacts that could occur from contact with wastes, measures will be put in place to ensure that personnel handling wastes are trained in the use of PPE for handling waste.

PPE required for handling non-hazardous waste will include the following:

- Coveralls;
- Safety glasses or chemical splash goggles;
- Gloves;
- Hearing protection;
- Safety boots (chemical-resistant with steel toe and shank);
- Hard hat; and
- Face shield.

PPE required for handling hazardous waste will include the following:

- Full-face or half-mask, air purifying respirators (IOSH approved);
- Coveralls;

- Gloves (chemical resistant);
- Hearing protection;
- Safety boots (chemical-resistant with steel toe and shank);
- Hard hat;
- Face shield; and
- Escape mask.

Waste Segregation

Non-hazardous waste will be physically separated from hazardous wastes. Non-hazardous waste will be segregated by type (plastics, glass, metal, biodegradable) in order to achieve the following:

- Maximize the possibilities for waste recycling or reuse;
- Minimize the possibility of contamination of non-hazardous wastes by hazardous wastes;
- Ensure that waste is properly contained to avoid release of hazardous substances to the environment;
- Ensure the proper management of each specific waste type; and
- Prevent mixture of incompatible wastes that could result in chemical reactions.

Waste storage

Wastes will be collected in bins/skips, appropriately labelled and colour-coded for easy identification and evacuation. Orientation labels such as 'This End Up' will be used for all containers bearing liquid wastes during all handling, storage, transportation and disposal activities.

The core characteristics of approved containers are as follows:

- Bins/skips will be colour-coded and labeled for easy identification;
- Food and perishable wastes will be sealed in bin bags and containers covered at all times to reduce odour and restrict access by vermin and scavengers.
- Chemicals, and any other hazardous liquids will be contained in compatible, appropriately sealed and labeled containers to prevent reaction with containers and spillage during handling.
- Bins/skips will be kept on pallets or other space buffers to prevent contamination in the event of a spill.
- Bins/skips will be maintained in good condition and stored with appropriate secondary containment.

Waste Container Identification

- Metals and cans – Blue Container
- Food Waste – Yellow Container
- Glass – Green container
- Cardboard, Paper, Plastics and Packaging - White Container
- Contaminated and hazardous waste – Red container
- Medical Waste – Specially supplied container by contractor.
- Used batteries – Black container.

Minimum requirements for waste storage facilities are as follows:

- Locate safe areas with limited chance of exposure to hazards and accidents.
- Facilities are to be enclosed with appropriate secondary containment to prevent spreading of waste and contamination of surrounding areas.
- Facilities are to be lined to prevent contamination of soil and ground water.
- Facilities are to be covered to prevent being washed off and spread by rain which could lead to contamination of soil, contamination of ground water; and air pollution via wind-borne odours and dusts.
- The entire area will be sealed off and operated with limited access.
- Safety signs will be used to indicate potential hazards and restricted access.
- Sufficient capacity will be maintained to contain anticipated types and volumes.
- Waste chemicals will have MSDS close by for easy identification and for emergencies.
- All hazardous waste (e.g., fuel, oil, used oil, paints, chemicals and contaminated soil) shall be stored in impervious containers in bunded areas of 110 percent capacity of the stored material to prevent contamination in case of accidental release.
- Effluent from the washing-down of concrete mixing and handling equipment will be contained within a bunded area of 110 percent capacity of the stored material. Effluent will be treated as hazardous waste.
- Chemical toilets must be provided for all employees, and located at convenient locations throughout the site. Toilets must be replaced by a registered contractor.
- Drinking water must be provided to contractors. Water supply will be from bottled water or existing farm water supply.
- Facilities will be provided for temporary accumulation and consolidation of waste. Waste storage will be on short-term basis. Some materials may be stored on a longer-term basis until volumes accrued are sufficient to support a selected waste management option.

Waste transportation

Waste stored on site will be periodically removed and transported to waste treatment or disposal facilities. Vehicles transporting waste must be capable of transporting waste safely. Vehicles must be loaded correctly and must have the appropriate labelling and warning signs attached to the vehicle. Appropriate firefighting and spill response equipment must also be transported with each vehicle to contain, manage and remove accidental spillages. A Waste Manifest Form must be completed for waste removed from the plant.

The form must include the following:

- Name and address of the contractor who generated the waste;
- Name of the waste transporter used to transport a load of waste;
- Registration number of the waste transport vehicle;
- Waste treatment license number of the waste transporter;
- Description of the waste transporter including its class and subcategories;
- Quantity of waste transported;
- Type of container used for transport;

- Name and address of transit points and the final destination of the waste; and
- Intended method of waste treatment, storage, recycling, processing, reprocessing or disposal at destination.

Copies of the Waste Manifest form must be retained on site and remedial action must be taken if copies are not available.

Waste treatment and disposal

Panel Recycling

Solar panels will be recycled once they are no longer of use.

Other Waste Disposal

The Project will ensure that the disposal of waste generated by its activities does not have an adverse impact on the environment or on public health and that the removal and treatment methods are aligned with the risk that the waste poses to the environment. Detailed records will be maintained documenting the type and quantity of waste which has been stored, transported, treated, recovered or disposed.

OPERATIONAL PHASE

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME

This following section defines the management programme for each of the identified goals during the operational phase. The programme is presented in the form of a table, which includes the components described. This programme consists of the following components:

Goals

Over-arching environmental goals for the management phase.

Objectives

The objectives are in place in order to meet these goals. These take into account the findings from existing studies and monitoring programmes.

Management Actions

The actions needed to achieve the objectives, taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.

Monitoring

Key actions to verify that objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

Criteria/Targets

The criteria or targets indicate the efficacy of the management programme. The targets should be readily measurable, understandable to the layperson, cost-effective to monitor, and meet legal requirements.

Remedial Actions

Specifies actions needed to be taken if the targets are not met; or if there is an unforeseen event.

Goals

The following are specified goals:

Goal 1: Waste Management

Goal 2: Pollution Control

Goal 3: Water Quality and Storm Water Management

Goal 4: Soil Erosion

Goal 5: Fire Management

Goal 6: Safety, Security and Emergency Procedures (including Fences)

Goal 1: Waste Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocation of sufficient resources for on-going Integrated Waste Management e.g. staff, equipment.</i></p>	<p>Pollution and odours</p>	<ol style="list-style-type: none"> 1. No solid waste may be incinerated on the property. 2. All vehicles transporting waste must be closed to avoid possible pollution of waste on transport routes. 3. Waste needs to be sorted and recycled where necessary. 4. Domestic waste not suitable for compost needs to be stored in skips for transport to a registered Landfill site. 5. An integrated waste management approach must be implemented on site, based on waste minimisation, reduction, recycling, re-use and disposal where possible. 	<p>Responsibility: Applicant</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff</p>	<p>If pollution on site is detected immediate actions must be taken to contain the pollution. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of pollution occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.</p>

Goal 2: Pollution Control

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocation of sufficient resources for on-going Integrated Waste and pollution control Management e.g. staff, equipment, budget.</i></p>	<p>Pollution, odours and health.</p>	<ol style="list-style-type: none"> 1. Waste to be stored on the property appropriate containers or facilities as. 2. All vehicles transporting waste must be closed to avoid pollution of transport routes. 3. Special measures such as surface drainage works to prevent water from running onto this area must be constructed. 	<p>Responsibility: Applicant</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff</p>	<p>If pollution on site is detected immediate action must be taken to contain the pollution. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of pollution occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.</p>

Goal 3: Water Quality and Storm Water Management Measures

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p>1] <i>Ensure allocation of sufficient resources for on-going Water Quality and Storm Water Management e.g. staff, equipment, budget</i></p>	<p>Pollution, odours, erosion and illegal quality of waste water discharge.</p>	<ol style="list-style-type: none"> 1. Ensure no pollution of any water resources, including surface water, storm water and groundwater takes place as a result of any activities on the site. 2. Any storm water channels must be monitored and maintained on a regular basis. 3. All waste must be removed on a weekly base. 4. If any erosion and/or degradation of the storm water channel or surrounds are noticed immediate action must be taken to rectify the situation. (Corrective and preventative measures taken will depend upon type and extent of erosion and/or degradation occurring). 	<p>Responsibility: Applicant</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff</p>	<p>If pollution or erosion is detected immediate action must be taken to contain the pollution or erosion. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of pollution or erosion occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.</p>

Goal 4: Erosion Control

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocation of sufficient resources) for on-going erosion control management (e.g. staff, equipment, budget</i></p>	<p>Erosion, sink-holes and or blocking of storm water systems. Damage to Infrastructure.</p>	<ol style="list-style-type: none"> 1. On-going control and management of roads, roadways and areas susceptible to erosion. 2. Ensure suitable vegetation cover or surface on non-hardened surfaces. 3. Control runoff of storm water to prevent soil erosion. 4. Avoid the formation of sink-holes on sensitive soils. 5. Management and control of erosion. 	<p>Responsibility: Applicant</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff</p>	<p>If erosion is detected immediate actions must be taken to contain the erosion. Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. Depending on type and extent of erosion occurred specialists may be contacted to provide specific recommendations. An incident report to be compiled and sent to municipal and governmental authorities.</p>

Erosion Control

Erosion control and maintenance will be an on-going process, especially erosion developing on or as a result of roads. The applicant must implement erosion control measures to ensure that no erosion occurs on site. The area must also be regularly monitored and erosion maintenance measures implemented to prevent erosion.

Goal 5: Fire Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocations of sufficient resources e.g. staff, equipment, Budget,) for Ongoing fire management</i></p>	<p>Pollution, damage to property and health risks. fire, to and</p>	<p>Comply with Fire Management Plan. Such legislation applies to the open countryside beyond urban limits and puts in place a range of legal requirements.</p> <p>The responsibilities of people who own or control land:</p> <p>The landowner on whose land a fire may start, or from whose land it may spread across boundaries, must have in place:</p> <ul style="list-style-type: none"> • Take all reasonable steps to notify the fire chief of the local authority should a fire break out. • Do everything in their reasonable power to stop the spread of the fire. <p>The Act also requires that should the owner be absent, a known and identified other person responsible needs to be present on or near this land to:</p> <ul style="list-style-type: none"> • Extinguish a fire if one breaks out, or assist or instruct others to do so • Take all reasonable steps to alert the neighbours and Fire Chief. • The owner may appoint an agent to act on his or her behalf to perform these duties. 	<p>Yearly pre-fire season equipment testing.</p> <p>Responsibility: Applicant</p>	<p>Adequate annual Budgets. On-going employment of staff</p>	<p>To be determined when required</p>

Goal 6: Safety and Security Measures and Emergency Procedures

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<i>Ensure allocation of sufficient resources for on-going safety, security and emergency procedures. e.g. staff, equipment, budget</i>	Pollution, fire, security and health risks.	<ol style="list-style-type: none"> 1. The site should be fenced and access allowed at controlled points. 2. One site emergency plans should be reviewed regularly. 	Responsibility: Applicant	Adequate annual Budgets. On-going employment of staff.	To be determined when required

Any emergency incident, originating at the facility, which falls within the definition of section 30 (1) a of the National Environmental Management Act (NEMA) Act 107 of 1998, must be dealt with by the facility in accordance with section 30 of NEMA". In the event of any incident the facility must ensure containment by the responsible person and report the incident to DFFE.

CHAPTER 6

ENVIRONMENTAL REPORTING/ EMERGENCY RESPONSE PLAN

In order to ensure that the necessary environmental issues are adequately addressed and recorded, the following environmental reporting shall be undertaken:

- Incident reporting; and
- Compliance reporting

See below for a template of an Incident Report to serve as a guideline for the recording and addressing of emergency incidents as and when they occur.

ENVIRONMENTAL INCIDENT REPORT

DATE:	File Ref:
NAME:	Copy to:
EXACT LOCATION OF INCIDENT:	

SECTION 1 : DESCRIPTION OF INCIDENT

SECTION 2 : REMEDIAL ACTION REQUIRED

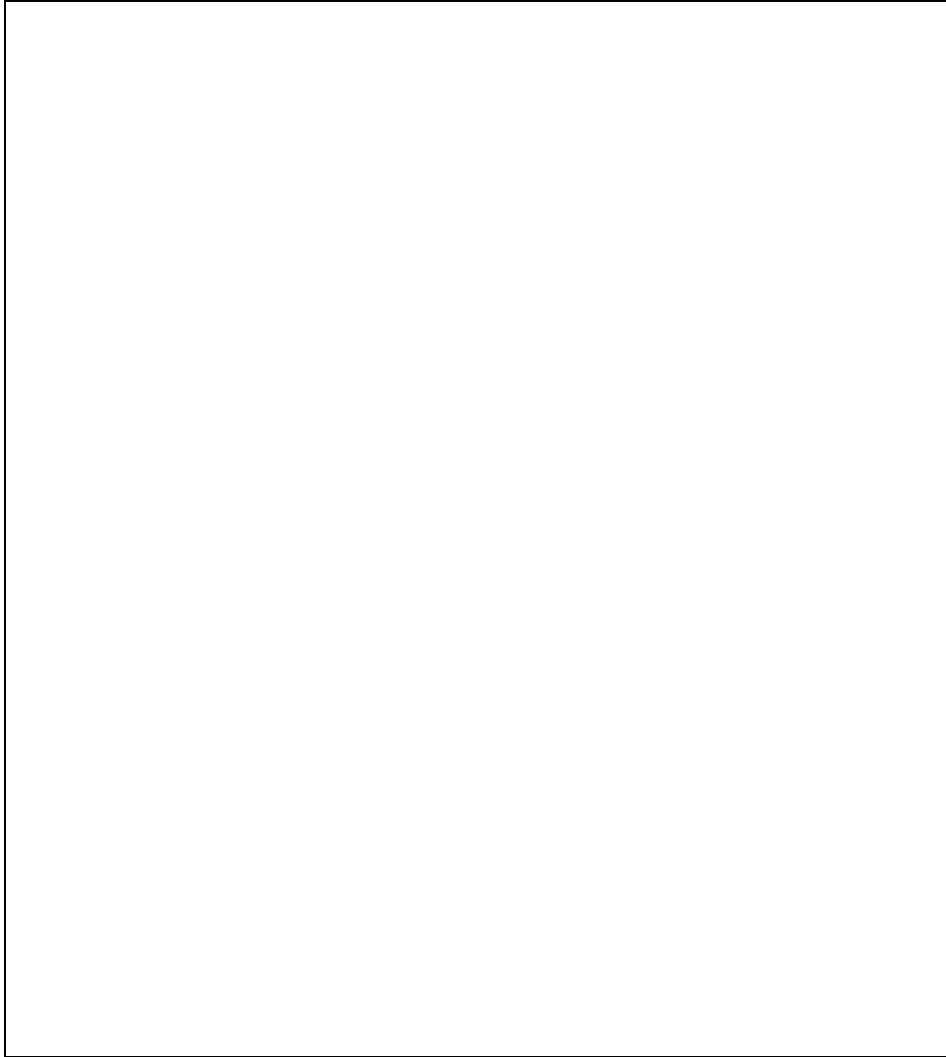
Remedial Action Due Date: _____
Confirmation of implementation: Name: _____ Date: _____

SECTION 3 : RELEVANT DOCUMENTATION

SECTION 4 : SIGNATURES

Municipal Engineer: Name: Date:
ECO: Name: Date:

SECTION 5: DRAWING/SKETCH



CHAPTER 7

DECOMMISSIONING PHASE

As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, the need to manage risks and potential residual impacts may remain well after operations have ceased.

The decommissioning phase EMP provides specific guidance with respect to the management of the environmental risks associated with the decommissioning stage of a project.

Closure and decommissioning impacts are likely to be similar to the construction phase impacts. The management actions and control under the construction phase EMP need to be implemented to mitigate the negative impacts on the environment and to restore the property to its natural state.

A decommissioning phase is where a structure is removed or otherwise modified to make it incapable for re-use for the original design purpose.

The results of environmental monitoring during the decommissioning phase will be used to assess the impact of the decommissioning on the surrounding environment and demonstrate compliance with regulatory requirements.

The actual scope of the decommissioning environmental monitoring will be established following consultation with the regulatory authorities. The format of decommission management strategy will probably be similar to that of earlier development phases and consist of the following:

- Management Principles
 - Develop monitoring procedures in accordance with standard protocols and the requirements of the environmental legislation.
 - Undertake environmental monitoring during the decommissioning phase as shown below.

Environmental monitoring during the decommission phase will include water quality, terrestrial flora rehabilitation monitoring.

Specific requirements include:

- Management measures would be limited to ensuring that decommissioning activities all remain within the authorised footprints. This monitoring would be carried out by the Environmental Control Officer (ECO).
- Ensure effective rehabilitation after decommissioning if this occurs.
- Keep security employed until demolition is completed to prohibit the erection of temporary structures.
- During demolition, the trails and archaeological site should be re-established (fenced) and rejuvenated to operate as an independent entity (without the solar).

CHAPTER 8

FINALISING SOLAR PV PANEL AREAS/ REHABILITATION SPECIFICATIONS AND SITE CLEAN-UP

The contractors must ensure that all temporary structures, equipment, materials and facilities used or created on site for, or during construction activities, are removed once the project has been completed. The construction sites must be cleared, and cleaned to the satisfaction of the developer.

Stabilisation and rehabilitation must take place immediately after construction operations have been completed. No vehicles or unauthorised personnel must be allowed onto areas that have been rehabilitated.

The areas impacted during construction must be stabilised and shaped according to the natural surrounding contours. If topsoil was removed during construction the topsoil must be used to stabilise the impacted areas.

The impacted areas must be re-vegetated with indigenous vegetation species within 3 months after completion of construction activities. Rehabilitated areas must be irrigated if required.

If erosion occurred the ECO must be informed immediately who will then recommend erosion mitigation measures to be implemented.

Alien vegetation monitoring of the rehabilitated areas and surrounds must be conducted on an annual basis and if alien vegetation is detected the ECO must be informed immediately who will then recommend eradication methods.

CHAPTER 9

ENVIRONMENTAL AWARENESS INDUCTION COURSE MATERIAL

WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe

the oceans



• plants, cars

WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
 - We have a right to a healthy environment
 - A Policy and System will be signed
-

HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP



WORKING AREAS

Workers & equipment must stay inside the site boundaries at all times



RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the stream



ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site



TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers



SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission



PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain & throw away where instructed



DUST

Try to avoid producing dust



NOISE

- Do not make loud noises around the site, especially near schools and homes
- Report or repair noisy vehicles



TOILETS

- Use the toilets provided
- Report full or leaking toilets



EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins



RUBBISH

- Do not litter – put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly



TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers - check & report leaks and vehicles that belch smoke
- Ensure loads are secure & do not spill



EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- Ambulance:
- Fire:
- Police: 10111



FINES AND PENALTIES

- Spot fines of between R20 and R2000
- Your company may be fined
- Removal from site
- Construction may be stopped



PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!



CHAPTER 10

COMPLIANCE

All conditions of the EMP must be adhered to onsite during the construction-, operational-, decommissioning- and rehabilitation phases of the proposed project. A copy of the EMP and all contractors on site must sign the Declaration of Understanding as proof of awareness and understanding of all the conditions to be adhered to on site in terms of the EMP.

CHAPTER 11

UPDATING/ADAPTING THE EMP

Although care has been taken to address all known relevant environmental issues for the development, it will become necessary to add or amend certain procedures or instructions to improve the efficiency of the EMP. Only those additions to, or amendments of, this EMP that will either improve environmental protection or can be proven not to have any negative effects would be considered to be included, and any amendments to the EMP must first be approved by the ECO and competent authority/ies i.e. DFFE.

REFERENCES

City of Cape Town (2002) Environmental Management Programme (Version 5) for Civil Engineering Construction Activities.

DEA&DP: ENVIRONMENTAL MANAGEMENT PROGRAMME. VER 5 (04/2002).
Guideline Document for the ECO / ESO and the ER

Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.