THE DEVELOPMENT OF THE 100MW LICHTENBURG 1 PHOTOVOLTAIC SOLAR ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR LICHTENBURG, NORTH WEST PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME:

Revision 1, August 2022

DFFE REFERENCE NUMBER: 14/12/16/3/3/2/1091/MP1

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PROJECT DETAILS

Title	:	Environmental Impact Assessment Process Environmental Management Programme – Revision 1: Lichtenburg 1 PV Facility, North West Province
DFFE Ref.	:	14/12/16/3/3/2/1092
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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ABBREVIATIONS

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

DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Impact Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIAr	Environmental Impact Assessment Report
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IPP	Independent Power Producer
kV	Kilo Volt
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NID	Notice of Intent to Develop
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
PIA	Paleontological Impact Assessment
PM	Post Meridiem; "Afternoon"
SACAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
SMME	Small, Medium and Micro Enterprise

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APPENDICES

CHAPTER 1: INTRODUCTION

This Environmental Management Programme has been compiled for the Lichtenburg 1 PV Facility. The project site identified for Lichtenburg 1 comprises a single privately-owned agricultural property (i.e. Portion 06 of the Farm Zamenkomst No. 04). The project site is located approximately 12km north of Lichtenburg and 5.5km south-east of Bakerville, and falls within Ward 16 of the Ditsobotla LM, of the Ngaka Modiri Molema DM, in the North West Province. Access to the site is obtained via an unsurfaced (gravel) road which can be accessed from the R505 regional road, located approximately 1.5km west of the project site. Lichtenburg 1 will be designed to have a contracted capacity of up to 100MW_{AC}, and will make use of photovoltaic (PV) solar technology.

This EMPr has been developed on the basis of the findings of the Environmental Impact Assessment (EIA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all ABO Wind Lichtenburg 1 PV (Pty) Ltd employees and contractors working on the pre-construction, construction, and operation and maintenance phases of Lichtenburg 1. The document must be adhered to and updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations, 2014 (as amended) and forms part of the EIA Report of the project.

In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, halted or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts. While no permitting or licensing requirements arise directly by virtue of Lichtenburg 1, this section will be applicable throughout the life cycle of the project.

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. The EMPr for the project was submitted as part of the EIAr dated March 2019 and approved in July 2019. In terms of Condition 15 of the original EA (dated 01 July 2019) and Chapter 5 of the EIA regulations of December 2014 (as amended), changes to the approved EMPr must be submitted to the Competent Authority for approval.

The Lichtenburg 1 PV project has executed a private Power Purchase Agreement (PPA) with a buyer. The original Eskom Cost Estimate Letters (CELs) were issued separately for each project within the larger cluster (Lichtenburg 1 PV, 2 PV and 3 PV). When considering the three projects together, Eskom has advised the following:

- The existing power line approved in the CEL for a loop-in-loop-out (LILO) connection (Alternative 1 as authorised) does not have sufficient capacity to connect to the facility.
- One power line to the Eskom Watershed Substation for all three projects from a central collector substation is the required and preferred connection solution.

This EMPr (Revision 1 – June 2022) has been updated to include the amendment of the preferred power line corridor to allow connection of Lichtenburg 1 PV to the collector substation complex at Lichtenburg 3 PV in terms of the of the above-mentioned requirements from Eskom.

Additions to this EMPr have been underlined and deleted sections which are no longer included or applicable for this updated EMPr version have been struck through for ease of reference.

CHAPTER 2: PROJECT DETAILS

ABO Wind Lichtenburg 1 PV (Pty) Ltd, a Special Purpose Vehicle (SPV), proposes the development of Lichtenburg 1, a PV facility and associated infrastructure on a site near Lichtenburg, in the North West Province. Lichtenburg 1 comprises of a commercial solar energy facility and forms part of a larger cluster (Lichtenburg PV 1, PV 2 and PV 3) and has executed a Private Purchase Agreement with a buyer. Lichtenburg 1 will be designed to have a contracted capacity of up to 100MW_{AC}, and will make use of photovoltaic (PV) solar technology.

2.1 Project Site

The project site identified for Lichtenburg 1 comprises a single privately-owned agricultural property (i.e. Portion 06 of the Farm Zamenkomst No. 04). The project site is located approximately 12km north of Lichtenburg and 5.5km south-east of Bakerville, and falls within Ward 16 of the Ditsobotla LM, of the Ngaka Modiri Molema DM, in the North West Province. Access to the site is obtained via an unsurfaced (gravel) road which can be accessed from the R505 regional road, located approximately 1.5km west of the project site.

Table 2.1 provides information regarding the proposed project site identified for Lichtenburg 1 and the associated infrastructure

Table 2.1: A description of the project site identified for Lichtenburg 1

Province	North West Province
District Municipality	Ngaka Modiri Molema District Municipality
Local Municipality	Ditsobotla Local Municipality
Ward Number(s)	Ward 16
Nearest Town(s)	» Lichtenburg (approximately 12km south of the project site) » Bakerville (approximately 5.5km north-west of the project site)
Farm Portion(s), Name(s) and Number(s)	**Lichtenburg 1:** » Portion 06 of the Farm Zamenkomst No. 04 **Grid connection:** » Portion 06 of the Farm Zamenkomst No. 04 » Remaining Extent of Portion 2 of the Farm Zamenkomst No. 04
SG 21 Digit Code (s)	**Lichtenburg 1:** » T0IP00000000000400006 **Grid connection** » T0IP00000000000400006 » T0IP00000000000200004
Current Zoning	Agriculture
Current land use	Agriculture
Site Extent	**Lichtenburg 1:** » 428ha **Grid connection:** » 46ha

2.2 Project Description

The proposed project will have a contracted capacity of up to 100MW$_{AC}$, and will make use of PV solar technology for the generation of electricity. The project will comprise the following key infrastructure and components:

- Arrays of PV solar panels with a contracted capacity of up to 100MW$_{AC}$.
- Mounting structures to support the PV panels (utilising either fixed-tilt / static, single-axis tracking, or double-axis tracking systems).
- A new up to 132kV power line from the Lichtenburg 1 PV's step-up/on-site substation to a proposed collector substation complex on Lichtenburg 3 PV.
- Cabling between the project's components, to be laid underground where practical.
- Auxiliary buildings such as offices and workshop areas for maintenance and storage.
- Temporary laydown areas required during construction.
- Internal access roads and perimeter security fencing around the development area.

A summary of the associated infrastructure proposed as part of Lichtenburg 1 is provided in **Table 2.2**, and described in more detail under the sub-headings below.

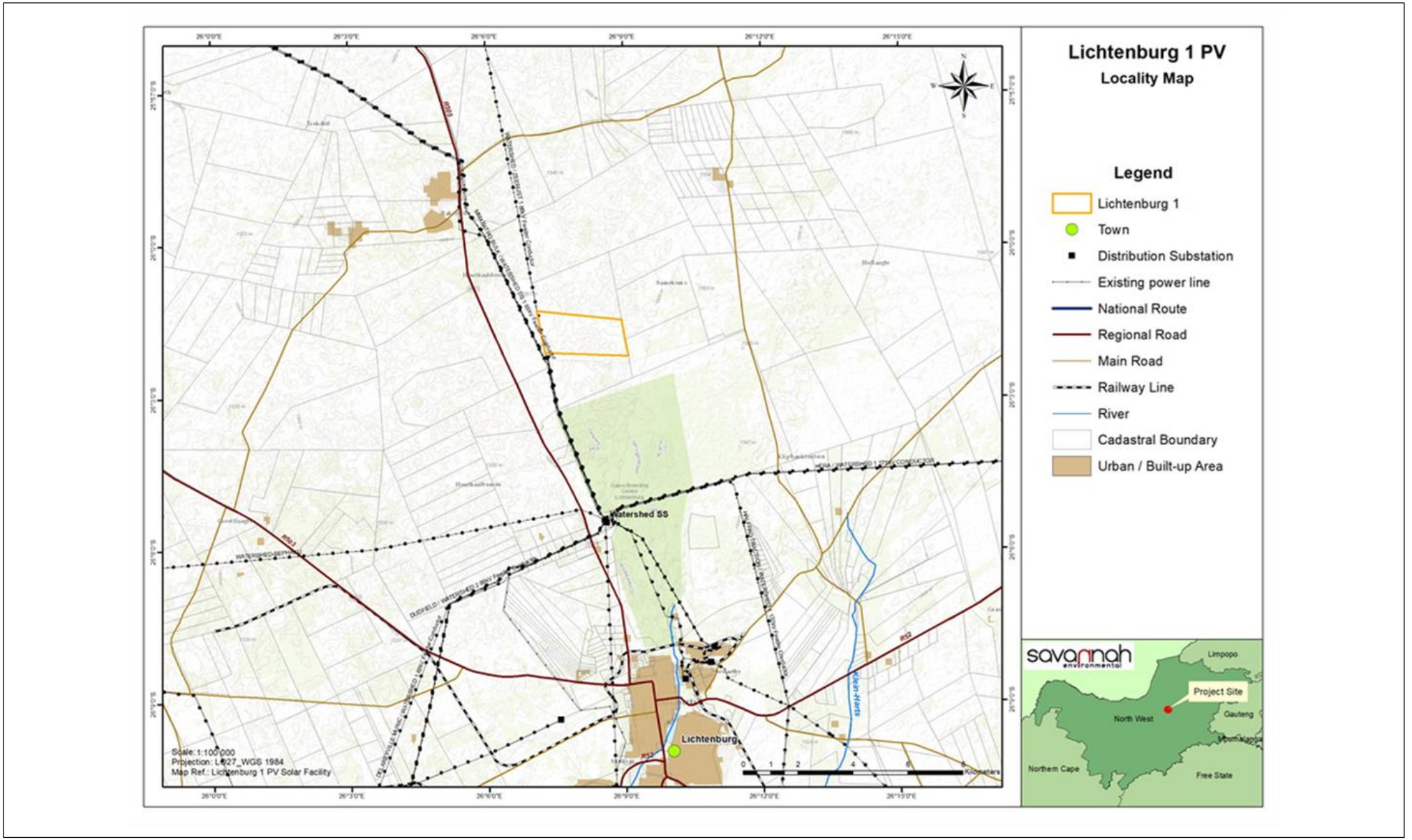

Figure 2.1: Locality map illustrating the location of the project site proposed for the establishment of Lichtenburg 1

Table 2.2: Planned infrastructure proposed as part of Lichtenburg 1

Infrastructure	Dimensions/ Details
Solar Facility	» PV technology. » Solar panels approximately 3.5m in height. » Centralised inverter stations approximately 3m in height, or string inverters mounted approximately 0.3m above ground. » Fixed-tilt, single-axis tracking, or double-axis tracking systems. » PV structures / modules approximately 170ha in extent
Supporting Infrastructure	» Gate house and security building of ~6m x6m. » Control Centre of ~31m x 8m. » Office Building of ~22m x 11m. » 2 x Warehouses of ~50m x 20m each. » Canteen and Visitors Centre of ~30m x 10m. » Rainwater tanks with a capacity of 10 000ℓ. » Perimeter fencing.
On-site substation	» On-site substation with a 33/132kV capacity. » Will occupy an area up to 1ha in extent.
Grid Connection	» A single 33/132kV power line is required for grid connection. » The power line servitude will be up to 36m in width (i.e. up to 18m on either side of the centre line of the power line). » Towers required to support the power line will be up to 24m in height and will comprise monopole or lattice structures.
Access road	» Access to the proposed site will be via the R505 regional road which traverses the eastern half of the project site in a north-west to south-east direction. » Permanent access roads will be constructed as follows: * Main access road – 10m wide (to be tarred if necessary). * Internal access road – 5m wide and up to 1km in length (to be gravel, unless where / if specific sections required to be tarred). * Internal access roads will occupy approximately 10ha.
Water Supply	» Approximately 26 657 m³ of water per year is required during construction (18 months). » Approximately 4659 m³ of water per year is required for operation (20 years). » The following water supply options are currently being considered (in order of preference): * Sourcing water from the Ditsobotla Local Municipality. * Sourcing water from another third-party water supplier. * Sourcing water from a borehole drilled on site. * All of the above supplemented by rainwater collection on site.

2.3 Activities and Components Associated with the PV Facility

A series of activities are proposed as part of the design, pre-construction, construction, operation, and decommissioning phases associated with the development of Lichtenburg 1. These are discussed in more detail under the respective sub-headings below.

2.3.1 Design and Pre-Construction Phase

Pre-planning

Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV array or associated infrastructure. While an objective of the EPC Contractor, who will be responsible for the overall construction of the project, will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications may take place. This EIA Report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be approved by the DFFE. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project, the DFFE will need to be notified and where relevant, approval obtained.

Conduct Surveys
Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, substation and the plant's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed project site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.3.2 Construction Phase

The construction phase will take up to 18 months to complete, and will entail a series of activities including:

Procurement and employment
At the peak of construction the proposed project is likely to create a maximum of 400 employment opportunities. These employment opportunities will be temporary, and will last for a period of up to 18 months (i.e. the length of construction). Employment opportunities generated during the construction phase will include low skilled, semi-skilled, and skilled opportunities. Solar PV projects make use of large numbers of unskilled and semi-skilled labour so there will be good opportunity to use local labour. Employment opportunities for the proposed solar energy facility will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

The majority of the labour force is expected to be sourced from the surrounding towns, and no labour will be accommodated on-site during the construction period.

Establishment of an Access Road to the Site
Access to the project site will be established for the construction of the facility. Access to the project site is possible through the use of existing unsurfaced farm roads, which can be accessed from the R505 regional road. The most appropriate access route will be utilised for the solar facility. Within the facility development footprint itself, access will be required from new / existing roads for construction purposes (and limited access for maintenance during operation). The final layout has been determined following the identification of site related sensitivities.

Undertake Site Preparation
Site preparation activities will include clearance of vegetation. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and / or spread on site.

Transport of Components and Equipment to Site

The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar facility. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTA) [1] by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.

Establishment of Laydown Areas on Site

Laydown and storage areas will be required for typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and laydown area will need to be established adjacent to the workshop area. The equipment construction camp serves to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the development. The laydown area will be used for the assembly of the PV panels and the general placement / storage of construction equipment. A temporary laydown area approximately 5ha in extent is required during construction. The temporary laydown area will be included within the development footprint of the facility.

Erect PV Cells and Construct Substation and Invertors

The construction phase involves installation of the PV solar panels and structural and electrical infrastructure required for the operation of the facility. In addition, preparation of the soil and improvement of the access roads is likely to continue for most of the construction phase. For array installations, vertical support posts are driven into the ground. Depending on the results of the geotechnical report, a different foundation method, such as screw pile, helical pile, micropile or drilled post / pile could be used. The posts will hold the support structures (tables) on which the PV modules would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the solar facility's on-site substation.

The construction of the substation will require a survey of the site, site clearing and levelling and construction of access road(s) (where applicable), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas, and protection of erosion sensitive areas.

[1] A permit will be required in accordance with Section 81 of the NRTA which pertains to vehicles and loads which may be exempted from provisions of the Act.

Establishment of Ancillary Infrastructure
Ancillary infrastructure will include a power line from the on-site/facility substation to the collector substation complex on Lichtenburg 3 PV's footprint, workshop, storage and laydown areas, gatehouse and security complex, as well as a temporary contractor's equipment camp.

The establishment of the ancillary infrastructure and support buildings will require the clearing of vegetation and levelling of the development site, and the excavation of foundations prior to construction. Laydown areas for building materials and equipment associated with these buildings will also be required.

Construction of the power line
A power line is constructed by surveying the power line route, constructing foundations for the towers, installing the towers, stringing the conductors, and finally rehabilitating disturbed areas and protecting erosion sensitive areas.

Undertake Site Rehabilitation
Once construction is completed and all construction equipment has been removed, the site will be rehabilitated where practical and reasonable. In addition, on full commissioning of the solar facility, any access points which are not required during operation must be closed and rehabilitated accordingly.

2.3.3 Operation Phase

The proposed solar facility is expected to operate for a minimum of 20 years. The facility will operate continuously, 7 days a week, during daylight hours. While the solar facility will be largely self-sufficient, monitoring and periodic maintenance activities will be required. Key elements of the Operation and Maintenance (O&M) plan include monitoring and reporting the performance of the solar facility, conducting preventative and corrective maintenance, receiving visitors, and maintaining security.

2.3.4 Decommissioning Phase

Depending on the continued economic viability of the solar farm following the initial 20-year operational lifespan, the operation phase will be extended or the facility will either be decommissioned. If it is deemed financially viable to extend the operation phase, existing components would either continue to operate, or be dissembled and replaced with new, more efficient technology / infrastructure available at the time. If the decision is made to decommission the solar facility, the following decommissioning activities will take place:

Site Preparation
Site preparation activities include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassembly and Removal of Existing Components
When the solar facility is ultimately decommissioned, the equipment to be removed will depend on the land use proposed for the site at the time. All above ground facilities that are not intended for future use at the site will be removed. Much of the above ground wire, steel, and PV panels of which the system is comprised, are recyclable materials and would be recycled to the extent feasible. The components of the solar facility would be deconstructed and recycled, or disposed of in accordance with applicable regulatory

requirements. The site will be rehabilitated and can be returned to agriculture or another beneficial land-use.

Future plans for the site and infrastructure after decommissioning

The generation capacity of the facility would have degraded by approximately 15% over the 20-year operations lifespan. The solar facility will potentially have the opportunity to generate power for a Merchant Market operation (i.e. the client would sell power on a bid basis to the market). Another option for the site after decommissioning is for agricultural activities to resume.

2.4 Findings of the Environmental Impact Assessment (EIA)

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with Lichtenburg12 that were identified and assessed through the EIA process include:

- Impacts on ecology, flora, fauna and hydrological features.
- Impacts on avifauna.
- Impacts to soils, land-use and agricultural potential.
- Impacts on heritage resources, including archaeology and palaeontology.
- Visual impacts on the area imposed by the components of the facility.
- Positive and negative socio- economic impacts.
- Traffic impacts.

2.4.1 Impacts on Ecology and Hydrology

The Ecological and Hydrological Impact Assessment assessed the impact of Lichtenburg 1 on the sensitive ecological and hydrological[2] features present within the project site for the life-cycle of the project. The assessment identified impacts within the construction and operation phases of the project.

During the construction phase, the impacts expected to occur include impacts on vegetation and listed protected plant species, faunal impacts, an increased erosion risk and increased alien plant invasion. The significance of the construction phase impacts ranges from medium to low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of mitigation.

During the operation phase, the anticipated impacts include altered runoff patterns due to rainfall interception by the PV panel infrastructure and compacted areas resulting in high levels of erosion, increased alien plant invasion, an increased erosion risk and faunal impacts. The significance of the impacts for the operation phase ranges from medium to low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified for the project.

[2] It must be noted that no sensitive hydrological features have been identified and confirmed within the Lichtenburg 1 project site by the specialist.

From the findings of the Ecological and Hydrological Impact Assessment (**Appendix D** of the EIA Report, 2019) it can be concluded that no impacts of high ecological or hydrological significance were identified which would hinder the development of Lichtenburg 1 and its associated infrastructure within the project site. The proposed development is considered to be appropriate and acceptable from an ecological and surface hydrological perspective and will not result in detrimental impacts to ecosystems and habitat features present within the project site and within the surrounding properties. The specialist has therefore indicated that the development may be authorised, constructed and operated, subject to the implementation of the recommended mitigation measures.

2.4.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E** of the EIA Report, 2019) is based on the findings of point count sampling techniques applied during two site visits undertaken in July 2018 and October 2018 (i.e. wet and dry season site visits). The avifauna impacts identified to be associated with Lichtenburg 1 will be negative and local to regional in extent. The duration of the impacts will be medium to long-term, for the lifetime of the PV facility.

During the construction phase of Lichtenburg 1, a loss of habitat due to clearance of vegetation is expected to occur. The significance of this impact can be reduced to low with the implementation of the recommended mitigation measures provided by the specialist.

Majority of the avifauna impacts associated with the development of Lichtenburg 1 will occur during the operation phase. These impacts include the creation of "new" avian habitat which refers to the creation of novel habitat for commensal or superior competitive bird species, the electrocution of birds due to the associated power line and collision with the PV panels and power line. The significance of the impacts will be low to medium, with the exception of a high significance for the impact of avian collision with the power line.

From the results of the avifauna assessment, it can be concluded that no fatal-flaws will be associated with the development of Lichtenburg 1 from an avifaunal perspective.

2.4.3 Impacts on Land Use, Soil and Agricultural Potential

The proposed Lichtenburg 1 project infrastructure is located on shallow, rocky soils with low to moderate-low land capability. The construction and operation of a PV facility on the project site is considered acceptable from a soils perspective as it will supplement and stabilise the landowner's income in an area where farming is susceptible to periodic droughts. Centre pivot irrigation areas, where good crop yields are obtained, have been avoided by the development infrastructure associated with Lichtenburg 1.

Impacts have been identified for both the construction and operation phases for Lichtenburg 1 (**Appendix F** of the EIA Report, 2019). The impacts associated with land use, soil and agricultural potential include an increased risk of soil erosion, potential chemical pollution and loss of land capability. The significance of the impacts ranges from low to medium with the implementation of the mitigation measures recommended by the specialist.

2.4.4 Impacts on Heritage Resources

The project site has been disturbed and transformed by agricultural activities which has led to the presence of pre-existing agricultural plough fields, grazing areas and farm buildings. Furthermore, throughout the agricultural areas within the project site, several heaps of rocks that have been removed from the agricultural fields were identified. No archaeological resources, graves or burial grounds were identified within the project site. In addition, no structures of heritage importance were recorded.

Considering the palaeontology of the project site, it was identified that the area in question is located within the Malmani Group which contains a number of stromatolitic dolomites. The geological structures of the project site suggest that the rocks are much too old to contain fossils other than blue-green algae. Taking account of the defined criteria, the potential impact to fossil heritage resources is negligible to extremely low.

The Heritage Impact Assessment (**Appendix H** of the EIA Report, 2019) identified impacts associated with the construction and operation of Lichtenburg 1. The impact on heritage resources include the archaeology and palaeontology of the project site.

Impacts on palaeontological and archaeological resources are expected to occur during the construction phase of Lichtenburg 1. The impacts relate to the excavations required for the construction of the facility and will occur only in the event that an archaeological or palaeontological resource is present. The significance of the impact will be low and no mitigation has been recommended by the specialist due to the lack of heritage resources within the area. The requirement for the development and implementation of a chance find procedure in the event of a heritage find has been included.

2.4.5 Visual Impacts

The Visual Impact Assessment (**Appendix H** of the EIA Report, 2019) identified negative impacts on visual receptors during the undertaking of construction activities and the operation phase of Lichtenburg 1.

During the construction phase the undertaking of construction activities will impact on sensitive visual receptors in close proximity to Lichtenburg 1. The construction phase will result in a noticeable increase in heavy vehicles utilising the roads which may cause a visual nuisance to other road users and landowners in the area. The construction phase visual impacts will have a low significance following the implementation of the recommended mitigation measures.

Visual impacts expected to occur during the operation phase includes impact on sensitive visual receptors in close proximity (i.e. within 3km) to the facility, visual impact on sensitive visual receptors within the broader region (i.e. within 3-6km), lighting impacts, solar glint and glare impacts, visual impact of the ancillary infrastructure, the visual impact on sensitive visual receptors located within a 500m radius of the associated power line infrastructure, and a visual impact of Lichtenburg 1 on the sense of place in the region. The significance of the visual impacts range from low to moderate with the implementation of the recommended mitigation measures. Visual impacts on sensitive visual receptors in close proximity to the PV facility are not considered to be a fatal flaw for the development. No mitigation is possible for the visual impact on sensitive visual receptors within 500m of the power line infrastructure, therefore only best practise measures can be implemented and have been recommended by the specialist. The specialist has indicated support for the development of Lichtenburg 1 from a visual perspective.

2.4.6 Social Impacts

The specialist study identified vulnerable communities within the broader area that may be affected by the development of Lichtenburg 1 and its associated infrastructure. Traditionally, the construction phase of a PV solar development is associated with the majority of social impacts. Many of the social impacts are unavoidable and will take place to some extent, but can be managed through the careful planning and implementation of appropriate mitigation measures. A number of potential positive and negative social impacts have been identified for the project, however an assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as fatal flaws.

The Social Impact Assessment (**Appendix I** of the EIA Report, 2019) identified positive and negative impacts that are expected to occur during the construction and operation phases of Lichtenburg 1. The assessment identified that the expected benefits associated with the project, which include generation of electricity from renewable sources and local economic and social development, outweigh the perceived impacts associated with the project.

During the construction phase, the positive impacts expected to occur include direct and indirect employment opportunities and skills development and economic multiplier effects. The significance of these impacts are medium with the implementation of the recommended enhancement measures. The negative social impacts expected to occur during the construction phase include an influx of jobseekers and change in population, safety and security impacts, impacts on daily living and moving patterns, nuisance impacts (i.e. noise and dust) and visual impacts. The significance of the negative construction phase impacts will be low to medium with the implementation of the recommended mitigation measures

During the operation phase the positive impacts expected to occur include direct and indirect employment opportunities and skills development, development of non-polluting, renewable energy infrastructure, and a contribution to Local Economic Development (LED) and social upliftment. The significance of the positive operation impacts will be medium to high with the implementation of the recommended enhancement measures. The negative impacts expected during the operation phase include a visual and sense of place impact and impacts associated with the loss of agricultural land. The significance of the negative operation impacts will be low to medium with the implementation of the recommended mitigation measures.

2.4.7 Impacts on Traffic

The Traffic Impact Assessment Report (**Appendix J** of the EIA Report, 2019) considered the impacts that the development of Lichtenburg 1 will have on the road network within the surrounding area.

During the construction phase imported elements associated with the development of Lichtenburg 1 will be shipped to and transported from the nearest and most practical port. It is estimated that the total number of heavy vehicle trips would vary between 4500 and 6000 during the construction phase. The calculated number of daily trips would be between 15 and 25. The impact of this on the road network would be negligible, as the additional peak hourly traffic would at most be 2 trips. The low construction and post construction traffic would have no significant impact on the existing traffic levels.

During the operation phase the total number of trips to be generated by the permanent workforce during the AM and PM peak period is 18 vehicles per hour. No other trips are expected to be generated during the operation phase and therefore the additional traffic is not considered to have a significant effect on the internal roads or the access roads and surrounding areas. The significance of the traffic impacts during the operation phase will be low with the implementation of the recommended mitigation measures.

2.5 Findings of the Amendment Application

Based on the specialist findings, it is concluded that the proposed amendments to the environmental authorisation are not expected to result in an increase to the significance ratings for the identified potential impacts. Specific findings were issued by the respective specialists, and are summarised below:

2.5.1 Impacts on Ecology and Hydrology

Based on a comparison between recent satellite images (Google Earth Satellite Image from December 2021) and satellite images used during the Ecological Assessment (Google Earth Image May 2018), land use practices remained the same (predominantly cattle grazing with a small area being cultivated to the south (within the Remaining Extent of Portion 2 of the Farm (Zamenkomst No.4) with no clear change in vegetation structure and the present ecological status of the assessed area. As such the need for a site visit as part of the proposed amendments was deemed unnecessary with the findings of the terrestrial and wetland/ecological study and assessment still regarded as applicable. It can be concluded that the proposed amendments will result in similar ecological impacts. Subsequently, from an ecological perspective, no objective or motives (identification of impacts of high ecological significance etc.) were identified which would hinder the proposed amendment.

2.5.2 Impacts on Avifauna

All impacts as presented in the 2018 Avifaunal Report will remain unchanged during the implementation of the proposed amendments, which will have no changed in the overall impact significance. In addition, the collector substation complex (on Lichtenburg 3 PV) will be located on habitat with a low avifaunal sensitivity (agricultural land) and will cover a small surface area, which will result in a low impact significance rating (when compared to the PV layout).

The proposed grid connection corridor is located close to existing power line servitudes, the advantage with the amended layout is that its placement along existing power lines will greatly increase the visibility of the overheard cables to passing birds (during daylight), thereby reducing avian collision with the overhead cabling structures.

2.5.3 Impacts in Heritage Resources

There is no objection to the proposed amendments on heritage grounds and no monitoring protocols are recommended.

2.5.3 Visual Impacts

In consideration of the proposed amendment, there is no (zero) change to the significance rating compared with the original Environmental Impact Assessment (EIA) VIA report and no additional visual impacts are envisaged. In addition to this, no new mitigation measures are required.

The proposed amendment is expected to have a neutral effect from a visual impact perspective i.e. no advantages or disadvantages are expected.

2.6 Environmental Sensitivity

From the specialist investigations undertaken for Lichtenburg 1, the following sensitive areas/environmental features have been identified and demarcated within the project site and avoided by the development footprint (where necessary):

» **Ecology** – The entire Lichtenburg 1 project site has been identified as being of a medium ecological sensitivity based on the presence of Savanna Grassland throughout the majority of the project site and power line corridor alternatives. Other areas of medium sensitivity are also present throughout the project site and the power line corridor alternatives which relates to the presence of Palaeo-Drainage Grassland. All three on-site substation alternatives are located within the Savanna Grassland. The only area considered to be sensitive from an ecological perspective is a cluster of *Vachelia (Acacia) erioloba* trees located along the northern boundary of the project site. This cluster is avoided by the proposed PV facility.

» **Bird Habitat and Sensitive Areas** – Areas of moderately high avifauna sensitivity are located within the eastern and western sections of the project site, which relates to the presence of Open Dolomite Grassland or Bush Clump Mosaics. These represent habitat or areas where a high number of bird species were recorded, but also include direct observations of collision-prone bird species. These areas also form part of the home ranges of the Northern Black Korhaan (*Afrotis afraoides*). Other features present within the project site considered to be of a moderately high avifauna sensitivity include artificial watering points located in the eastern portion of the project site. These watering points attract large numbers of granivore passerine and non-passerine bird species due to the availability of water. Development within the moderately high avifauna sensitivity areas is permissible, and these areas are not considered to be restricted in terms of the placement of infrastructure associated with Lichtenburg 1. Areas of moderately high sensitivity are also located within the power line corridor alternatives. Areas of medium avifauna sensitivity are areas related to the presence of Open Dolomite Grasslands or Bush Clump Mosaics, power line servitudes and wet grasslands. These habitat types provide suitable foraging habitat for certain threatened and near threatened bird species, including large terrestrial bird species (e.g. Northern Black Korhaan) with the potential to interact (e.g. collide) with the proposed electrical infrastructure. However, reporting rates at the site for threatened and near threatened bird species was relatively low, thereby suggesting a medium sensitivity within these areas, even though the majority of the habitat is natural.

» **Heritage:** Palaeontological observations were made within the project site; however these are not considered to carry any heritage value and are therefore not considered to be sensitive to the development of Lichtenburg 1. These palaeontological observations include piles of rock, rock fragments (with some possibly stromatolitic) and loose boulders with no fossils present. No archaeological features were identified.

A comparative assessment of the layout and design alternatives was undertaken from an environmental perspective and all alternatives were assessed at the same level by all specialists. The layout indicating the grid connection corridor and the location of the development footprint of the collector substation complex and the Lichtenburg 1 PV Facility is included as **Figure 2.2** below. The layout of the grid connection corridor for the Lichtenburg 1 PV Facility overlain onto the identified environmental sensitivities is included as **Figure 2.3** below. The map indicating Lichtenburg 1 PV Facility in relation to Lichtenburg 3 PV Facility is included as **Figure 2.4.**

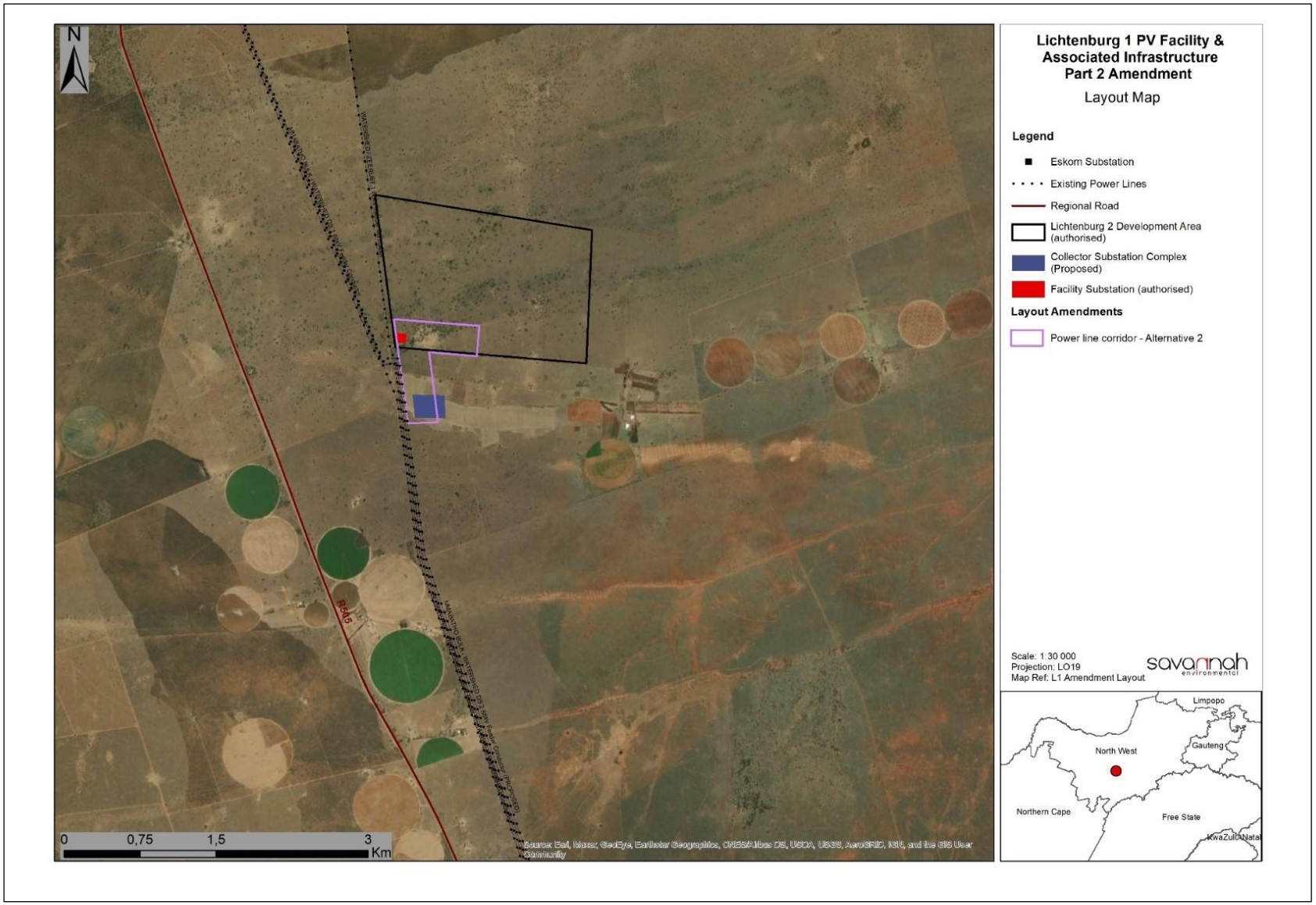

Figure 2.2: Layout of the grid connection corridor and the location of the development footprint of the collector substation complex and the Lichtenburg 1 PV Facility

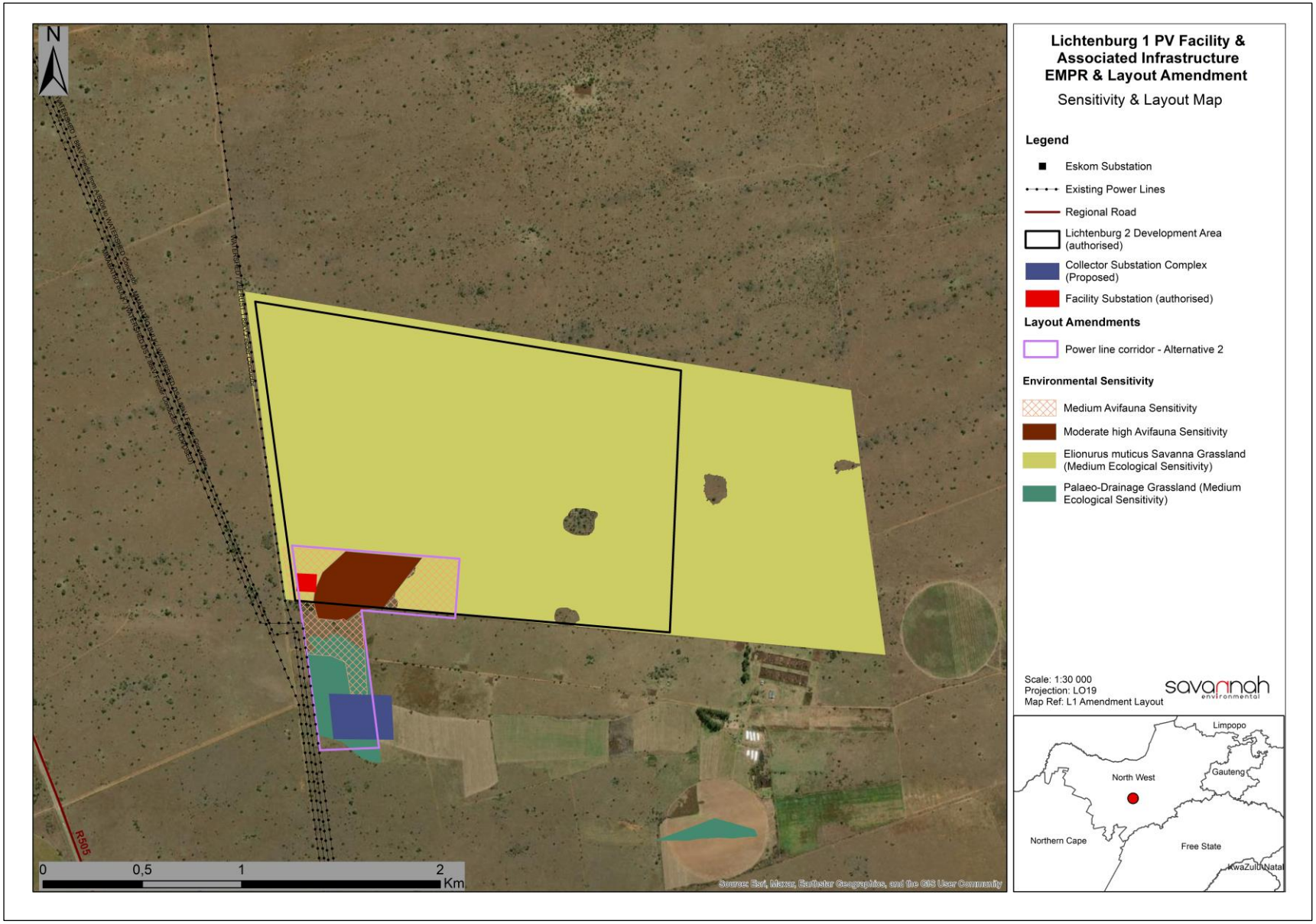

Figure 2.3: Layout of the grid connection corridor for the Lichtenburg 1 PV Facility overlain onto the identified environmental sensitivities

2.7 Contents of this Environmental Management Programme (EMPr)

This Environmental Management Programme (EMPr) has been prepared as part of the EIA process being conducted in support of the application for Amendment of Environmental Authorisation of Lichtenburg 1. This EMPr has been prepared in accordance with DFFE's requirements as contained in the Acceptance of Scoping received on 09 November 2018, and Appendix 4 of the 2014 EIA Regulations (GNR 326), condition 15 of the Environmental Authorisation for Lichtenburg 1 (dated 01 July 2019) and Chapter 5 of the EIA regulations of December 2014 (as amended). It provides recommended management and mitigation measures with which to minimise impacts and enhance benefits associated with the project.

An overview of the contents of this EMPr, as prescribed by Appendix 4 of the 2014 EIA Regulations (GNR 326), and where the corresponding information can be found within this EMPr is provided in **Table 2.3**.

Table 2.3: Summary of where the requirements of Appendix 4 of the 2014 NEMA EIA Regulations (GNR 326) are provided in this EMPr.

Requirement	Location in this EMPr
(1) An EMPr must comply with section 24N of the Act and include – (a) Details of – (i) The EAP who prepared the EMPr. (ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	Chapter 2 Appendix J
(b) A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.	Chapter 2
(c) A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.	Chapter 2 Figure 2.3 Appendix A
(d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –	
(i) Planning and design.	Chapter 5
(ii) Pre-construction activities.	Chapter 5
(iii) Construction activities.	Chapter 6
(iv) Rehabilitation of the environment after construction and where applicable post closure.	Chapter 7
(v) Where relevant, operation activities.	Chapter 8
(f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to – (i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation. (ii) Comply with any prescribed environmental management standards or practices. (iii) Comply with any applicable provisions of the Act regarding closure, where applicable. (iv) Comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable.	Chapters 5 - 8

Requirement	Location in this EMPr
(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(i) An indication of the persons who will be responsible for the implementation of the impact management actions.	Chapters 5 - 8
(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.	Chapters 5 - 8
(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.	Chapters 6
(m) An environmental awareness plan describing the manner in which – (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work. (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Chapter 6
(n) Any specific information that may be required by the competent authority.	Table 2.4
(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

An overview of the contents of this EMPr, as prescribed by DEA's Acceptance of Scoping received on 09 November 2018, and where the corresponding information can be found within this EMPr is provided in **Table 2.4**.

Table 2.4: Summary of where the requirements prescribed by DEA's Acceptance of Scoping are provided in the EMPr.

DEA requirement for EIA	Response / Location in this EMPr
The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:	
i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.	Chapters 5 - 8
ii. The final site layout map.	Chapter 2 Figure 2.2
iii. Measures as dictated by the final site layout map and micro-siting.	Chapters 5 - 8
iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	Chapter 2 Figure 2.3
v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	Chapter 2 Figure 2.3
vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	Chapter 6 Objective 13
vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist	Appendix E

DEA requirement for EIA	Response / Location in this EMPr
familiar with the site and be implemented prior to commencement of the construction phase.	
viii. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Appendix D
ix. An open space management plan to be implemented during the construction and operation of the facility.	Appendix C
x. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	Appendix F
xi. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	Appendix G
xii. A fire management plan to be implemented during the construction and operation of the facility.	Appendix I
xiii. An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	Appendix G
xiv. 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.	Effective mitigation measures for the handling and storage of hazardous substances are included in Chapter 6 Objective 20 and Chapter 8 Objective 8
xv. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	No hydrological features are present within the Lichtenburg 1 project site and as such no measures for the protection of hydrological features have been included in the EMPr. Measures to protect other environmental sensitive areas have been identified and are included in Chapters 5 - 8

2.8 Project Team

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326) the applicant appointed Savannah Environmental (Pty) Ltd as the independent environmental consultants responsible for managing the

application for EA and the supporting Scoping and EIA process. The application for EA, and Scoping and EIA process, wass managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

2.8.1 Details and Expertise of the Environmental Assessment Practitioner (EAP)

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned), and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 12 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

Jo-Anne Thomas and Lisa Opperman are the EAPs responsible for preparing this EMPr. An overview of their expertise to prepare the EMPr is provided below, and copies of their Curricula Vitae (CVs) detailing the Savannah Environmental team's expertise and relevant experience are provided in **Appendix J** to this EMPr.

» **Jo-Anne Thomas** is a Director at Savannah Environmental (Pty) Ltd and the registered EAP for the EIA for this project. Jo-Anne holds a Master of Science Degree in Botany (M.Sc. Botany) from the University of the Witwatersrand, and is registered as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. During this time she has managed and coordinated a multitude of large-scale infrastructure EIAs, and is also well versed in the management and leadership of teams of specialist consultants, and dynamic stakeholders. Jo-Anne has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPrs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

» **Lisa Opperman** was an Environmental and GIS Consultant at Savannah Environmental. Lisa has a Bachelor of Science Honours Degree in Environmental Management (B.Sc. Honours) and 3 years of experience in the environmental field. Her key focus was on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects. She was involved in several EIAs for energy generation projects across South Africa.

» **Nkhensani Masondo** is a Senior Environmental Consultant at Savannah Environmental. Nkhensani holds a Bachelor of Arts degree specialising in Geography and Archaeology, a BSocSci Environmental Analysis and Management Honours Degree and 6 years of experience in the environmental fields. Nkhensani is responsible for environmental permitting, authorisations and compliance, drafting environmental impact assessments and stakeholder engagement.

Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 12 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development, and therefore have extensive knowledge and experience in EIAs and environmental management, having managed and drafted EMPrs for numerous other power generation projects throughout South Africa.

2.8.2 Details of the Specialist Consultants

A team of specialist consultants have been appointed as part of the EIA project team in order to adequately identify and assess potential impacts associated with the project, and have also provided input into this EMPr (refer to **Table 2.5**).

Table2.5: Specialist Consultants which provided input into this EMPr.

Specialist Study	Specialist Company	Specialist Name
Ecology and Wetlands	Nkurenkuru Ecology & Biodiversity	Gerhard Botha
Avifauna	Pachnoda Consulting	Lukas Niemand
Soils, Land Use, Land Capability and Agricultural Potential	Terra Africa Environmental Consultants	Mariné Pienaar
Heritage (Archaeology and Palaeontology)	CTS Heritage	Jenna Lavin
Visual	LOGIS	Lourens du Plessis
Social	Savannah Environmental	Sarah Watson
Social (External peer review)	Dr. Neville Bews and Associates	Dr. Neville Bews
Traffic	Knight Piésold	Amory Le Roux-Arries

CHAPTER 3 : PURPOSE AND OBJECTIVES OF THE EMPR

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

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through to those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site rehabilitation (soil stabilisation, re-vegetation) and operation. The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of Lichtenburg 1. The document will be adhered to and updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended) (refer to **Table 2.3**). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for Lichtenburg 1 and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

The EMPr has the following objectives:

- Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with Lichtenburg 1.
- Ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- Identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- Propose mechanisms and frequency for monitoring compliance, and prevent long-term or permanent environmental degradation.
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the EIA process.

The mitigation measures identified within the EIA process are systematically addressed in the EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

ABO Wind Lichtenburg 1 PV (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr, and through its integration into the relevant contract documentation provided to parties responsible for construction and/or operation activities on the site. The adequacy and efficacy of implementation is to be monitored by an independent Environmental Control Officer (ECO). Since this EMPr is part of the EIA process for Lichtenburg 1, it is important that this document be read in conjunction with the EIA Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the Environmental Authorisation, the stipulations in the Environmental Authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

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

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CHAPTER 4: STRUCTURE OF THIS EMPR

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

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

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

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

Project Component/s	List of project components affecting the objective, i.e.: » PV Panels » Access roads; and » Associated infrastructure.
Potential Impact	Brief description of potential environmental impact if objective is not met.
Activity/Risk Source	Description of activities which could affect achieving the objective.
Mitigation: Target/Objective	Description of the target and/or desired outcomes of mitigation.

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

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

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

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

CHAPTER 5: PLANNING AND DESIGN MANAGEMENT PROGRAMME

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

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

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

5.1 Objectives

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

No no-go areas have been identified within the project site. Recommended mitigation measures are however required to be implemented to minimise impacts on identified sensitive areas (as detailed in Section 2.5 of this EMPr).

Project Component/s	» PV Panels » Access roads » Power line » On-site substation » Inverter stations » Transformer » Underground cabling » Associated buildings (i.e. workshop, ablution facilities, control room, storage).
Potential Impact	» Impact on identified sensitive areas. » Negative visual impact associated with the planning of the PV facility. » Increased risk of veld fire and damage to property as a result.
Activities/Risk Sources	» Positioning of all the facilities components and the viewing of the project components by observers » Construction of the underground cabling » Connection to the on-site substation » Access road construction
Mitigation: Target/Objective	» The design of the power line and on-site substation responds to the identified environmental constraints and opportunities. » Optimal planning of infrastructure to minimise visual impact.

	» Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer Contractor	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Developer Geotechnical specialist	Pre-construction
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Developer	Pre-construction
An ecological pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated must be undertaken prior to the commencement of the construction phase.	Developer Specialist	Pre-construction
Before construction commences individuals of listed species (specifically geophytes and succulents) within the development footprint that would be affected, must be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey, and according to the recommended rations (as specified within the pre-construction walk-through report). Permits from the relevant provincial authorities, i.e. the North-West Department of Rural, Environment and Agricultural Development, must be obtained before the individuals are disturbed.	Developer Specialist	Pre-construction
At least one additional avifauna pre-construction survey is recommended, each consisting of a minimum of 1-2 days which is necessary to inform the operation management plan. The survey should coincide with the peak wet season when most of the drainage lines and wetland features in the wider study region are inundated. This will enable the observer to obtain quantified data on waterbird richness and potential flyways, which will contribute towards the understanding of impacts related to collision trauma with the panels.	Avifauna specialist	Pre-construction
All artificial livestock watering points that are to be spanned by overheard powerline corridors be relocated/removed to prevent potential bird collisions (e.g. when birds congregate at the watering holes in an attempt to drink/ingest water or when birds of prey are hunting prey attracted to the water resource.	Avifauna specialist	Pre-construction
The Endangered Wildlife Trust (EWT) must be consulted to identify an appropriate pylon design for the associated power line. The pylon design must incorporate the following design parameters: » The clearances between the live components must be as wide as possible within the design limitations / capabilities of the power line. » The height of the tower must allow for unrestricted movement of terrestrial birds between successive pylons.	Developer	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
» The live components must be "bundled" to increase the visibility for approaching birds. » "Bird streamers" must be eliminated by discouraging birds from perching above the conductors. In addition, conductors must be strung below the pole to avoid bridging the air gap by perching birds of prey.		
Obtain any additional environmental permits required (e.g. water use license, and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DFFE.	Developer	Project planning
A suitably qualified Invasive Alien Plant expert must map and quantify the Invasive Alien Plant (IAP) and weeds on the site. This must be undertaken with the aim of developing a suitable IAP and Weed Management plan as per DFFE and NEMBA requirements.	Developer Specialist	Pre-construction
An IAP consultant with registered Pest Control Operator (PCO) in the field of Noxious weed management must develop a management plan for the site. The IAP management plan needs to address the legality, according to NEMBA, of moving plant propagules across the site	Developer Specialist	Pre-construction
Retain and maintain natural and / or cultivated vegetation immediately adjacent to the development footprint/servitude. Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised. Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.	Developer	Project planning
A designated access to the site must be created and clearly marked to ensure safe entry and exit.	Developer Contractor	Design
Internal access roads must be carefully planned to maximise road user safety and limit any intrusion on the neighbouring property owners and road users.	Developer Contractor	Design
Roads must be designed so that changes to surface water runoff are avoided and erosion is not initiated.	Developer Contractor	Design
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Developer Contractor	Design
The road network to access the panel arrays should be established first and then all vehicular movement must be restricted to within this road network. This will minimise the impact of construction traffic.	Developer Contractor	Design and Planning
Construction vehicles carrying materials to the site must avoid using roads through densely populated built-up areas so as to not disturb existing retail and commercial operations.	Developer Contractor	Design and Planning
Contractors and construction workers must be clearly informed of the no-go areas.	Developer Contractor	Prior to the commencement of construction
Demarcation of no-go areas must reflect the exact footprint of the construction area, including panel foundations and all roads	Developer Contractor	Prior to the commencement of construction

Mitigation: Action/Control	Responsibility	Timeframe
and infrastructure which are to be surveyed and pegged before any physical construction commences on site.		
Compile a comprehensive stormwater management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of stormwater within the site, as well as appropriate drainage around the site (**Appendix G**).	Developer Contractor	Design
Plan and placement of light fixtures for the plant and the ancillary infrastructure in such a manner so as to minimise glare and impacts on the surrounding area.	Developer Contractor	Planning.
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer Contractor	Pre-construction
Plan the placement of laydown areas and construction equipment camps in order to minimise vegetation clearing and impacts on identified sensitive areas.	Developer	Pre-construction
No temporary site camps must be allowed outside the development footprint of the project.	Developer	Design and planning
An experienced independent Environmental Control Officer (ECO) must be appointed for the construction phase. The Environmental Officer (EO) will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations included in the Environmental Authorisation are implemented to ensure compliance.	Developer	Pre-construction
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Developer Contractor	Pre-construction
All areas to be cleared should be clearly demarcated. Sensitive areas as demarcated on the sensitivity map should be avoided, and where such areas occur within or near the development area, they should be clearly demarcated as no-go areas. Only those individuals of protected plant species directly within the development footprint should be cleared.	Developer	Design review phase
Areas outside of the footprint, including sensitive areas, must be clearly demarcated (using fencing and appropriate signage) before construction commences and must be regarded as no-go areas.	Developer Contractor	Pre-construction
Underground cables and internal access roads must where possible be aligned as much as possible along existing infrastructure to limit damage to vegetation.	Developer Contractor	Design Pre-construction
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the PV facility and the ancillary infrastructure. The following is recommended: » Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). » Limit mounting heights of fixtures, or use foot-lights or bollard lights. » Make use of minimum lumen or wattage in fixtures. » Making use of down-lighters or shielded fixtures.	Developer Contractor	Design Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
» Make use of Low Pressure Sodium lighting or other low impact lighting. » Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes.		
Training and skills development programmes to be initiated prior to the commencement of the construction phase.	Developer Contractor	Pre-construction
A local procurement policy must be adopted to maximise the benefit to the local economy.	Developer	Pre-construction
Develop a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) prior to the tender process and invite them to bid for project-related work where applicable.	Developer	Pre-construction
Where applicable, any tender documentation which may be prepared for the project is to stipulate the use of local labour as far as possible.	Developer Contractor	Pre-Construction
Inform local community members of the construction schedule and exact size of workforce (e.g. Ward Councillor, surrounding landowners).	Developer Contractor	Pre-Construction
Recruitment of temporary workers onsite is not to be permitted. A recruitment office with a Community Liaison Officer should be established to deal with jobseekers.	Developer Contractor	Pre-Construction
Set up a labour desk in a secure and suitable area to discourage the gathering of people at the construction site.	Developer Contractor	Pre-Construction
Have clear rules and regulations for access to the proposed site.	Developer Contractor	Pre-Construction
Local community organisations and policing forums must be informed of construction times and the duration of the construction phase. Also procedures for the control and removal of loiters at the construction site should be established.	Developer Contractor	Pre-Construction
Security company to be appointed and appropriate security procedures to be implemented.	Developer Contractor	Pre-Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Pre-construction
A comprehensive employee induction programme must be developed and utilised to cover land access protocols, fire management and road safety.	Contractor	Pre-construction
Have a personnel trained in first aid on site to deal with smaller incidents that require medical attention.	Contractor	Pre-construction
Prepare a Fire Management Plan (FMP) (**Appendix I**) in collaboration with surrounding landowners.	Developer	Pre-construction
Communicate the FMP to surrounding landowners and maintain records thereof.	Developer	Pre-construction Construction

Mitigation: Action/Control	Responsibility	Timeframe
Prepare a Method Statement pertaining to the clearance of vegetation under solar panels in accordance with the FMP.	Developer Contractor	Pre-construction
All Eskom requirements must be complied with for work in or near Eskom servitudes.	Developer Contractor	Planning and pre-construction
Where sensitive visual receptors are likely to be affected (i.e. residents of homesteads and settlements in close proximity), the developer must enter into negotiations regarding the potential screening of visual impacts at the receptor site. this may entail the planting of vegetation, trees or the construction of screens. Visual screening is most effective when placed at the receptor itself.	Developer Contractor	Planning and pre-construction

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Demarcated sensitive areas are avoided at all times. » Design and layouts respond to the mitigation measures and recommendations in the EIA Report. » Minimal exposure of ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 3km) and within the region. » Employment and business policy document that sets out local employment and targets completed before the construction phase commences. » Training and skills development programme undertaken prior to the commencement of construction phase. » Employee induction programme, covering land access protocols, fire management and road safety. » Ensure a security company is appointed and appropriate security procedures and measures are implemented. » A local procurement policy is adopted.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction. » Monitor ongoing compliance with the FMP and method statements.

OBJECTIVE 2: Ensure the selection of the best environmental option for the alignment of the power line and underground cabling

Underground cables will be laid between the PV panels, the transformers and the switchgear. This will require the excavation of trenches within which they can then be laid. A new overheard powerline from the PV facility to connect to the step-up/onsite substation and then to connect to the collector substation complex located at the Lichtenburg PV3 Facility. Existing access roads will be used for the facility where possible.

Project Component/s	» Underground cabling. » Power line. » Temporary internal access roads.
Potential Impact	» Routes that degrade the environment unnecessarily, particularly with respect to loss of indigenous flora, and erosion. » Impact on the power line on sensitive features.

Activities/Risk Sources	» Alignment of underground cabling. » Alignment of power line. » Alignment of new access roads.
Mitigation: Target/Objective	» Ensure selection of best environmental option for alignment of the linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

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

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

OBJECTIVE 3: Minimise stormwater runoff

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

Mitigation: Action/Control	Responsibility	Timeframe
Appropriately plan hard-engineered erosion protection structures.	Developer Contractor	Planning and design
Design an appropriate stormwater management plan for implementation during construction and operation (**Appendix G**). This plan must ensure the suitable handling of stormwater within the site.	Developer Contractor	Planning and design
Construction must include appropriate design measures that allow surface and sub-surface movement of water. Drainage measures must promote the dissipation of stormwater runoff.	Developer Contractor	Planning and design

Performance Indicator	» Appropriate stormwater management plan developed for implementation prior to commencement of construction.

Monitoring	» Minimal erosion.

OBJECTIVE 4: To ensure effective communication mechanisms

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

Project component/s	» PV Panels » Access roads » Power line » Underground cabling » Laydown area » Associated buildings and associated infrastructure (workshop, storage facility, ablution facility, substation, inverters, transformers etc).
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with the PV facility construction » Activities associated with the PV facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

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

Performance Indicator	» Effective communication procedures in place.

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

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

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

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

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

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

CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION

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

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

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

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

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

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager, Site Manager, Internal Environmental Officer, Safety and Health Representative, Independent Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. **Figure 6.1** provides an organogram indicating the organisational structure for the implementation of the EMPr.

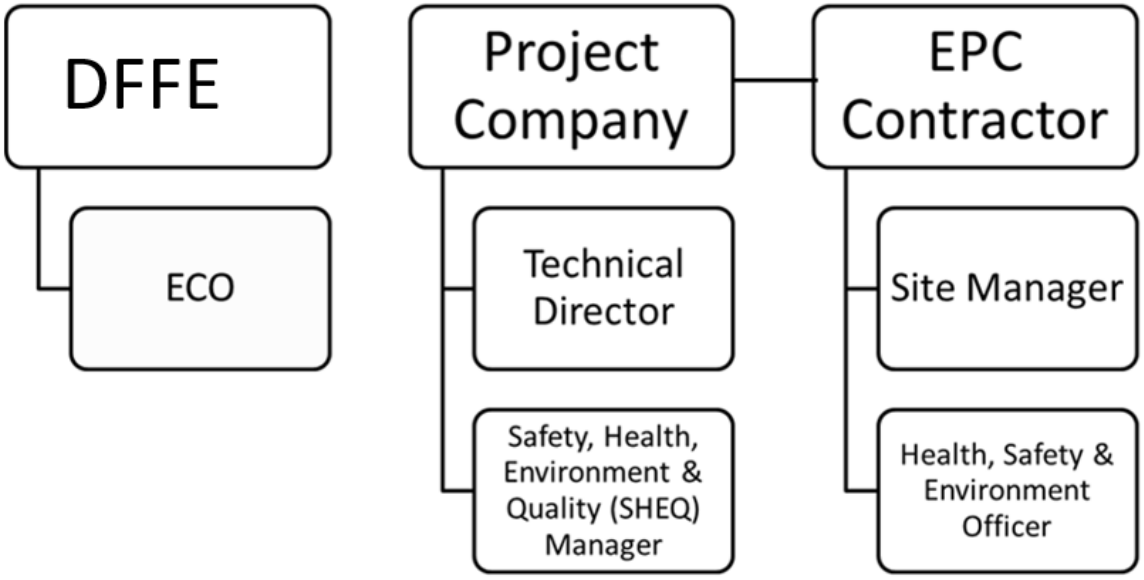

Figure 6.4: Organisational structure for the implementation of the EMPr

Construction Manager will:

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

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

- Be fully knowledgeable with the contents of the EIA.
- Be fully knowledgeable with the contents and conditions of the Environmental Authorisation.
- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- Have overall responsibility of the EMPr and its implementation.
- Conduct audits to ensure compliance to the EMPr.
- Ensure there is communication with the Technical Director, the ECO, the Internal Environmental Officer and relevant discipline engineers on matters concerning the environment.
- Be fully knowledgeable with the contents of all relevant licences and permits.

- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- Confine activities to the demarcated construction site.

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

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

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

be increased if required. However, in the absence of the ECO there should be a designated owner's environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

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

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

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

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

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

6.2 Objectives

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

OBJECTIVE 2: Minimise impacts related to inappropriate site establishment

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

All unattended open excavations shall be adequately demarcated and/or fenced. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project Component/s	» Area infrastructure (i.e. PV panels, substation, inverters, transformers, switchgear and ancillary buildings). » Linear infrastructure (i.e. underground cabling, power line and internal access roads and fencing).
Potential Impact	» Hazards to landowners and the public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species. » Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.
Activities/Risk Sources	» Any unintended or intended open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site. » The viewing of the construction of the PV facilities by visually sensitive observers.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint. » Minimal visual intrusion by construction activities and intact vegetation cover outside of the immediate construction work areas.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner.	Contractor	Site establishment, and duration of construction
Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.	Contractor	Site establishment, and duration of construction
Reduce the construction phase through careful logistical planning and productive implementation of resources.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Contractor	Construction
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Contractor	Construction
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Construction
Restrict construction activities where possible to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
Rehabilitate all disturbed areas, construction areas, servitudes, etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.	Contractor	Construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes. The development (including the development footprint and contractor's equipment camp) must also be secured and fenced and clearly demarcated.	Contractor	Site establishment, and duration of construction
The electrical fencing should be constructed in a manner which allows for the passage of small and medium sized mammals and small avifauna. Steel palisade fencing (20 cm gaps min) is a good option in this regard as it allows most medium-sized mammals to pass between the bars, but remains an effective obstacle for humans. Alternatively, the lowest strand or bottom of the fence should be elevated to 30cm above the ground which should be sufficient to allow smaller animals, reptiles and tortoises to pass through (tortoises retreat into their shells when electrocuted and eventually succumb from repeated shocks), but still remain effective as a security barrier.	Contractor	Site establishment
The construction camp used to house equipment must be located in a disturbed area where possible and must be screened off as far as practical during the entire construction phase.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
Visual impacts must be reduced during construction through minimising areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soil as closely as possible to their original contour and vegetation.	Contractor	Site establishment, and duration of construction
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but must be temporarily stored in a demarcated area.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers so that the surrounding environment is not polluted (at least one sanitary facility for each sex and for every	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
30 workers as per the 2014 Construction Regulations; Section 30(1) (b)) at appropriate locations on site). The facilities must be placed within the construction area and along the road.		
Ablution or sanitation facilities must not be located within 100m from a watercourse or within the 1:100 year flood.	Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at the site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. Provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction
Foundations and trenches must be backfilled to originally excavated materials as much as possible. Excess excavation materials must be disposed of only in approved areas, or, if suitable, stockpiled for use in reclamation activities.	Contractor	Site establishment, and duration of construction and rehabilitation

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site. » Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.
Monitoring	» An incident reporting system is used to record non-conformances to the EMPr. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager. » Monitoring of vegetation clearing during construction (by contractor as part of construction contract). » Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

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

At the peak of construction the proposed project is likely to create a maximum of 400 employment opportunities. These employment opportunities will be temporary, and will last for a period of up to 18 months (i.e. the length of construction). Employment opportunities generated during the construction phase will include low skilled, semi-skilled, and skilled opportunities. Solar PV projects make use of large numbers of unskilled and semi-skilled labour so there will be good opportunity to use local labour from the surrounding towns.

Security personnel will be deployed on a shift basis. Contractors and their employees are expected to be accommodated at existing accommodation facilities in the study area and surrounding towns. Construction equipment will need to be stored at appropriate locations on site.

In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development

footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the EIA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

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

Mitigation: Action/Control	Responsibility	Timeframe
All construction vehicles must adhere to clearly defined and demarcated roads. No driving outside of the development boundary must be permitted.	Contractor	Construction
The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified in the EIA Report. The location of this construction equipment camp/s must be approved by the project EO.	Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.	Contractor	Site establishment, and during construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan (refer to **Appendix I**) must be developed with emergency procedures in the event of a fire.	Contractor	Erection: during site establishment Maintenance: duration of contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	During construction.
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Duration of contract
A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.	Contractor	Construction
No disturbance of flora or fauna must be undertaken outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Workers must be aware of the importance of not polluting rivers or wetlands (especially those located outside of the project site) and the significance of not undertaking activities that could result in such pollution, and this awareness must be promoted throughout the construction phase.	Contractor and EO	Pre-construction Construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s	Pre-construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction

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

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Employment of local community members (i.e. source labour from within the municipal area focused on the communities in closest proximity to the site) should be undertaken where possible.	Developer, Local Municipality, and Contractor	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and developer in identifying people whose skills may correspond with the required job specifications.	Developer, Local Municipality, and Contractor	Pre-construction
An equitable process should be promoted whereby locals and previously disadvantaged individuals (including women) are considered for employment opportunities.	Developer, and Local Municipality	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the construction process.	Developer, Local Municipality, and Contractor	Pre-construction
Identify potential opportunities for local businesses.	Developer	Pre-construction
Tender documentation (if any are required) should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	Developer Contractor	Pre-construction
A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour.	Developer Contractor	Pre-construction
Skills training and capacity building where possible should be embarked upon from the onset of the construction phase and even prior to the construction phase if possible (as mentioned above)	Developer Contractor	Pre-construction and construction
Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations.	Developer	Pre-construction and construction

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

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

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

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

Mitigation: Action/Control	**Responsibility**	**Timeframe**
The developer, in discussions with the local municipality, should aim to employ a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible.	The developer, Contractor, and Local Municipality	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations in identifying people whose skills may correspond with the job specifications.	Contractor, and Local Municipality	Pre-construction
In cases for the semi-skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	The developer, Contractor, and Local Municipality	Duration of construction
A proactive consultative skills-audit should be undertaken in the local communities where job creation is currently a significant need.	The developer, and Local Municipality	Pre-construction, and construction
Appropriate training should be provided as per a decided upon skills development plan to narrow the gap between skills and demand. It is preferable that training be of such a nature that the skills thereby acquired are transferable and of real benefit in other employment contexts.	The developer, and Local Municipality	Pre-construction, and construction

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

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

The inflow of jobseekers to the proposed site would be the greatest during the peak construction period of the PV facility, but also when the construction activities of the other large construction projects are becoming less intensive. Other possible negative impacts due to the workforce's presence in the area and especially when jobseekers come to the area would include misconduct of workers, trespassing of workers

on privately owned farms, the possible increase in crime, littering, increase in traffic, increase in noise, the development of informal vending stations, and poaching of livestock.

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

Mitigation: Action/Control	Responsibility	Timeframe
Implement a transparent approach and open consultation with adjacent property owners, prior and throughout the construction period in order to provide a platform where grievances or requests can be addressed before issues become contentious.	Contractor	Pre-construction, construction
Local labourers should remain at their existing residences.	Contractor	Construction
On-site security should be active prior to the construction phase.	The developer	Pre- construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction
Sufficient water and sanitation facilities should be provided for the workers on site during the construction phase.	Contractor	Construction
The construction site should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	Contractor	Construction
The applicant, local leaders, and the Local Municipality should jointly develop a strategy to minimise the influx of jobseekers to the area.	The developer, local leaders and Local Municipality	Pre-construction, construction
Informal vending stations should not be allowed on or near the construction site.	Contractor	Construction
Develop a transparent communication and recruitment process to minimise the influx of jobseekers to the area.	The developer, and Contractor	Pre-construction
The recruitment process and the use of contractors should be clearly communicated to the local communities.	The developer	Pre-construction

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

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

It is estimated that the total number of heavy vehicle trips for a 100MW$_{AC}$ PV facility would vary between 4500 and 6000. These trips would be more over the 12-18 month construction period, which could result in 15 to 25 daily trips to the site. The impact of the trip generation would however be negligible as the additional peak hourly traffic would be up to 2 trips which would have no significant impact on the existing traffic service levels.

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

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a construction period traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted (refer to **Appendix F**).	The developer and EO	Pre-construction
Gravel roads should be sprayed with water to limit dust creation if feasible and reasonable from an environmental perspective (water scarce area), or an appropriate dust suppressant should be used.	Contractor and EO	Construction
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.	The developer and EO	Planning and design
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
contractor to ensure that these are in good working order and not overloaded.		
Strict vehicle safety standards should be implemented and monitored.	The developer, Contractor and EO	Construction
A designated access to the proposed site must be used to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep any new hard road surfaces as narrow as possible.	Contractor	Duration of contract
All construction vehicles must remain on properly demarcated roads. No construction vehicles must be allowed to drive over the vegetation except where no clear roads are available. In such cases a single track must be used and multiple paths must not be formed.	Contractor	Duration of contract
Stagger infrastructure delivery to the site where possible.	Contractor	Duration of contract
Staff and general trips where possible must occur outside of peak traffic periods.	Contractor	Duration of contract
Construction materials to be sourced from local suppliers as much as possible to limit the impact on the regional road network	Contractor	Duration of contract

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed EO must monitor indicators listed above to ensure that they have been implemented.

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

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

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

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

Project Component/s	» PV panels. » Contractors' camps. » Access roads. » Laydown areas. » Power line.
Potential Impact	» Workers not from the local areas are involved in criminal activities and/or fires occur. » Inflow of workers could result in increased safety and security risks.
Activities/Risk Sources	» Theft of construction material. » On-site accidents. » Spread of sexually transmitted diseases. » Littering and environmental pollution.
Mitigation: Target/Objective	» Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

Mitigation: Action/Control	Responsibility	Timeframe
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	Contractor	Pre-construction
Screening of applicants could lessen perceived negative perceptions about the outside workforce.	Contractor	Pre- construction
All staff should undergo a general Health and Safety induction and simplified environmental awareness training session	Contractor (and sub-contractor/s)	Duration of contract
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant act.	Contractor (and sub-contractor/s)	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule, and movement of workers.	Developer and Contractor	Construction
Procedures and measures to prevent, and in worst cases, attend to fires, must be developed in consultation with the surrounding property owners and the Local Municipality	Developer, Local Municipality, and local communities	Pre- construction and when required
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Appropriate fire-fighting equipment must be present on site and selected members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires.	Contractor	Construction
The construction site should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	Contractor	Construction
Construction activities should not interfere with the activities on surrounding properties.	Contractor	Construction

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

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

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

» *Noise and dust pollution* - During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the site as well as main and internal access roads. The intensity of the negative impacts, would, however depend on the wind direction and timing of construction activities.

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

Project Component/s	» Construction activities associated with the PV facility and linear infrastructure. » Vegetation clearing. » Delivery of any component required within the construction phase.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals.

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

Mitigation: Action/Control	Responsibility	Timeframe
Adequate parking for all employees, contractors and sub-contractors must be made available and should not impact negatively on neighbouring farmers.	Contractor	Pre-construction and construction
Local labourers should be used during the construction phase to limit the inflow of outsiders to the area.	Contractor	Construction
Compile and implement a traffic management plan (Refer to **Appendix F**) for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted.	Contractor	Pre-construction
Strict vehicle safety standards should be implemented and monitored.	Developer	Construction
Should abnormal loads have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government.	Contractor (or appointed transportation contractor)	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimise impacts on local commuters consideration must be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.	Contractor	Duration of contract
Ensure that any damage to internal roads because of construction activities is repaired before completion of the construction phase.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with suitable material.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the contractor.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Dust suppression techniques must be implemented on all exposed surfaces during periods of high wind. Such measures may include wet suppression, chemical stabilisation, the use of a wind fence, covering surfaces with straw chippings and re-vegetation of open areas.	Contractor	Duration of contract

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

OBJECTIVE 10: Minimisation of the development footprint and disturbance of topsoil

Project Component/s	» PV Panels » Underground cabling » Ancillary buildings » Access roads » On-site substation

	» Power line
Potential Impact	» Impacts on natural vegetation. » Loss of indigenous natural vegetation due to construction activities. » Impacts on soil. » Loss of topsoil
Activity/Risk Source	» Vegetation clearing » Site preparation and earthworks. » Excavation of foundations. » Construction of the internal access road. » Construction of underground cabling. » Construction of power line and on-site substation. » Site preparation (e.g. compaction). » Foundations or PV panel equipment installation. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats on-site » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise loss of topsoil. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.	EO and Contractor	Site establishment and duration of contract
Land clearance must only be undertaken immediately prior to construction activities and unnecessary land clearance must be avoided.	Contractor	Construction
In terms of best practice and for rehabilitation purposes, it is essential that a 150mm layer of topsoil from the building footprints (i.e. the on-site substation and contractor's site camp) be stripped and stockpiled prior to the commencement of construction activities in each area.	EO and Contractor	Site establishment and duration of contract
The extent of clearing and disturbance to the natural vegetation must be kept to a minimum so that impact on flora and fauna is restricted.	Contractor	Site establishment and duration of contract
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing. No vegetation removal must be allowed outside the designated project development footprint.	Contractors in consultation with the EO	Duration of Construction
Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.	EO and Contractor	Site establishment and duration of contract
No-Go areas are to be demarcated with tape and warning signs prohibiting access erected. Plant and vehicle operators must be instructed by the EO on where these No-Go sites are.	EO and Contractor	Construction
Topsoil must be removed and stored separately and must be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.	EO and Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
All fill material must be sourced from a commercial off-site suitable/permitted and authorised source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site. Permits must be kept on site.	EO and Contractor	Duration of contract
Top soil and subsoil must be stockpiled separately and replaced according to the correct profile, i.e. topsoil replaced last. Stockpiles must not be situated such that they obstruct natural water pathways and drainage channels.	Contractor	Site establishment and duration of contract
Top soil stockpiles must not exceed 2m in height.	Contractor	Site establishment and duration of contract
Soil stockpiles must be dampened with dust suppressant or equivalent to prevent erosion by wind.	Contractor	Construction
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months. Stockpiles older than 6 months must be enriched before they can be used to ensure the effectiveness of the topsoil.	Contractor	Site establishment and duration of contract
All graded or disturbed areas which will not be covered by permanent infrastructure such as paving, buildings or roads must be stabilised with erosion control mats (geo-textiles) and revegetated.	Contractor	Construction
Ridges and areas which include protected and red data species must be avoided at all costs during construction, unless the necessary permits are obtained.	EO	Pre-construction; Site establishment
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
Topsoil must be stockpiled and managed in terms of the erosion management plan (**refer to Appendix G**).	Contractor	Duration of contract
A site rehabilitation programme must be developed and implemented.	EO and Contractor in consultation with Ecologist	Duration of contract
Topsoil used for rehabilitation purposes should be reused to mitigate disturbed areas and should not be mixed with sub-soils.	EO and Contractor	Rehabilitation; Post-construction

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

OBJECTIVE 11: Minimise soil degradation and erosion and loss of land capability

The soil on site may be impacted in terms of:

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

Project Component/s	» PV Panels. » Underground cabling. » Ancillary buildings. » Construction of the internal access roads. » Power line. » On-site substation.
Potential Impact	» Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Creation of impenetrable surfaces. » Bare soils surfaces due to the removal of vegetation. » Earthworks which destroy the natural layers of the soil profiles. » The construction of access roads and PV panels and associated infrastructure which will cover soil surfaces. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » High velocity discharge of water from construction activities.
Mitigation: Target/Objective	» Minimise extent of disturbed areas. » Minimise activity within disturbed areas. » Minimise soil degradation (mixing, wetting, compaction, etc.). » Minimise soil erosion. » Minimise instability of embankments/excavations. » Revegetate, maintain and monitor the site. » Keep the project footprint as small as possible.

Mitigation: Action/Control	Responsibility	Timeframe
Identify disturbed areas and restrict construction activity to these areas.	EO and Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
Any erosion problems observed must be rectified immediately and monitored thereafter to ensure that they do not re-occur.	EO and Contractor	Construction Operation
All bare areas, affected by the development, must where possible be re-vegetated with locally occurring species, to bind the soil and limit erosion potential.	EO and Contractor	Construction Rehabilitation
Re-instate as much of the eroded area to its pre-disturbed, "natural" geometry (no change in elevation).	EO and Contractor	Construction Rehabilitation
Roads and other disturbed areas must be regularly monitored for erosion problems and problem areas must receive follow-up monitoring by the EO to assess the success of the remediation.	EO and Contractor	Construction Rehabilitation
A method statement must be developed and submitted to the engineer to deal with erosion issues prior to bulk earthworks operations commencing	EO and Contractor	Before and during construction
During construction the contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas	EO and Contractor	During construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	EO and Contractor	Design and construction
Minimise removal of vegetation which adds stability to soil.	EO and Contractor	Construction
Protective measures must be installed where there are possibilities of surface water sheet flow causing erosion.	EO and Contractor	Erection: Before construction Maintenance: Duration of contract
Stabilisation of cleared areas to prevent and control erosion must be actively managed. This includes: Brush cut packing, mulch or chip cover, straw stabilising, watering, planting/sodding, hand seed-sowing of locally-occurring indigenous species, hydroseeding of locally-occurring indigenous species, soil binders and anti-erosion compounds, gabion bolsters and mattresses for flow attenuation, geofabric, hessian cover and log/ pole fencing	EO and Contractor	Erection: Before construction Maintenance: Duration of contract
Erosion control measures: Run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, shade nets, gabions or temporary mulching over denuded area as required.	EO and Contractor	Erection: Before construction Maintenance: Duration of contract
No soil is to be stripped from areas within the site that the contractor does not require for construction works.	EO and Contractor	Construction
Anti-erosion measures such as silt fences must be installed in disturbed areas.	Contractor	Construction
Erosion control measures to be regularly maintained.	EO and Contractor	Construction
Regular monitoring for erosion must take place to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should	EO and Contractor	Construction and operation

Mitigation: Action/Control	Responsibility	Timeframe
be rectified as soon as possible as outlined in the erosion management plan (**Appendix G**).		

Performance Indicator	» No activity outside demarcated disturbance areas. » Limited soil erosion around site. » No activity in restricted areas.
Monitoring	» Limited level of soil erosion around the site. » Acceptable state of excavations, as determined by the EO. » Monthly inspections of sediment control devices by the EO. » Monthly inspections of surroundings, including washes (outside the development area) by the EO. » An incident reporting system will record non-conformances. » On-going visual assessment of compliance with erosion prevention by Contractor and ECO. » Monitor visual signs of erosion such as the formation of gullies after rainstorms and the presence of dust emissions during wind storms. » Any signs of soil erosion on site should be documented (including photographic evidence and coordinates of the problem areas) and submitted to the management team of the project. » Monitor compliance of construction workers to restrict construction work to the clearly defined limits of the construction site to keep footprint as small as possible. Monitoring to be undertaken by the ECO.

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

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	» Vegetation clearing. » Construction of the internal access roads. » Construction of the power line and on-site substation. » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	» Minimise footprints of disturbance of vegetation/habitats. » Minimise loss of protected and indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Vegetation clearing must be limited to the required footprint for actual construction works and operational activities. No unnecessary vegetation must be cleared. Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
Search and Rescue (S&R) of all protected plants that will be affected by the development (**Appendix E**), especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions), should take place. The necessary permits must be in place.	Contractor	Duration of construction
Monitor and control declared weeds and invader species. Continually monitor the re-emergence of these species and manage according to the invasive species management plan.	Contractor	Duration of construction

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation. » Ecosystem fragmentation is kept to a minimum. » Ecosystem functionality is retained and any degradation prevented. » Re-establishment of rescued species.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr. » Where vegetation is not re-establishing itself in areas where surface disturbance occurred, soil samples must be collected, analysed for pH levels, electrical conductivity (EC) and major plant nutrient levels (calcium, magnesium, potassium) and sodium. » When vegetation re-establishment still remains unsatisfactory, the bulk density of the soil should be measured with a penetrometer to determine whether compaction is an issue. » The results must be submitted to a professional soil or agricultural scientist for recommendations on the amendment of the issue to ensure that the vegetation cover is established and erosion prevented.

OBJECTIVE 13: Minimise the establishment and spread of alien invasive plants

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices. Consequences of this may include:

» Loss of indigenous vegetation;
» Change in vegetation structure leading to change in various habitat characteristics;
» Change in plant species composition;
» Change in soil chemical properties;
» Loss of sensitive habitats;
» Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
» Fragmentation of sensitive habitats;
» Change in flammability of vegetation, depending on alien species; and
» Hydrological impacts due to increased transpiration and runoff.

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

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction and operation
A suitably qualified contractor must be appointed to implement the Invasive Alien Plant (IAP) plan. PCO to appoint and supervise (on site) a qualified clearing team to implement the IAP management plan.	Contractor PCO	Construction
The IAP management plan must discuss the best practises for managing IAP and Weeds. EO will use this to monitor progress and methods used.	PCO EO	Construction
When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.	Contractor	Construction and operation
No plant propagules (seeds or otherwise) are to be introduced onto the site. Any soil to be introduced to the site must be from sites assessed by the IAP practitioner.	Contractor Specialist	Construction and operation
No herbicides must be recommended by anyone other than a registered PCO.	PCO	Construction and operation
Clearing methods must themselves aim to keep disturbance to a minimum.	Contractor	Construction
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and	Contractor	Construction and operation

Mitigation: Action/Control	Responsibility	Timeframe
identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act)		
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation

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

OBJECTIVE 14: Minimise the impacts on fauna

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

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

Project Component/s	» PV facility. » Power line. » On-site substation. » Contractor's camp and laydown area.
Potential Impact	» Loss or displacement of fauna. » Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site.
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or PV equipment installation. » Mobile construction equipment. » Underground cabling and road construction activities.

Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species

Mitigation: Action/Control	Responsibility	Timeframe
The extent of clearing and disturbance to the natural vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment and duration of contract
Any fauna directly threatened by the construction activities must be removed to a safe location by a suitably qualified person.	Suitably qualified person	Construction
The collection, hunting or harvesting of any plants or animals at the site must be strictly forbidden. Personnel must not be allowed to wander off of the demarcated construction site.	Contractor	Construction
All construction vehicles must adhere to a low speed limit (30km/h) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction Operation
A firebreak must be maintained around the development boundary to avoid potential fires occurring within the facility from spreading into the surrounding grasslands, subsequently posing a threat to faunal species occurring within the surrounding environment.	Contractor	Construction Operation
All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.	Contractor	Construction Operation
The intentional harming or killing of animals will be prohibited through on-site supervision and worksite rules.	Contractor	Construction Operation
Implement a faunal removal plan/ rescue plan with designated/ trained personnel and contact numbers.	Contractor	Duration of contract
All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity. » The trenches must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed by a suitably qualified person in a safe manner, unharmed, and placed in an area where the animal will be comfortable. » All mammal, large reptiles and avifauna species found injured during construction must be taken to a suitably qualified veterinarian or rehabilitation centre to either be euthanized in a humane manner or cared for until it can be released again.	Contractor	Duration of construction

Performance Indicator	» No disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on faunal species (i.e. noted/recorded fatalities)
Monitoring	» Observation of vegetation clearing activities by EO throughout construction phase. » Supervision of all clearing and earthworks. » Recording faunal fatalities to monitor success of relocation efforts.

	» An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 17: Appropriate Stormwater Management

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

A Stormwater Management Plan is attached as **Appendix G**.

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

Mitigation: Action/Control	Responsibility	Timeframe
Any stormwater within the site must be handled in a suitable manner, i.e. clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, shade nets, or gabions trapping sediments and reduce flow velocities.	Contractor/ Operator and Engineers	Planning, design and operation
Stormwater structures should as far as possible not concentrate runoff by piped systems or similar.	Contractor	Design Construction
All roads and other hardened surfaces must have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk	Contractor	Design Construction
Stormwater control systems must be implemented to reduce erosion on the project site.	Contractor	Design Construction
New access roads within the site are to be constructed according to design and contract specifications. The access routes must have suitable stormwater management plans and erosion control measures.	Contractor	Design Construction
Drainage measures must promote the dissipation of storm water run-off.	Contractor/Operator Developer	Design Construction
All stormwater mitigation measures must be implemented according to the Stormwater Management Plan (**Appendix G**).	Contractor	Construction

Performance Indicator	» No impacts due to runoff » Minimise erosion as far as possible
Monitoring	» Appropriate stormwater management system in place

OBJECTIVE 18: Protection of heritage resources

The project site has been disturbed and transformed by agricultural activities which has led to the presence of pre-existing agricultural plough fields, grazing areas and farm buildings. Furthermore, throughout the agricultural areas within the project site, several heaps of rocks that have been removed from the agricultural fields were identified. No archaeological resources, graves[3] or burial grounds were identified within the project site. In addition, no structures of heritage importance were recorded.

Considering the palaeontology of the project site, it was identified that the area in question is located within the Malmani Group which contains a number of stromatolitic dolomites. These were formed in warm shallow sea and are the accumulation of layer upon layer of minerals deposited by blue-green algae (also known as cyanobacteria) and rarely some filamentous algae. Minerals deposited by the algae include calcium carbonate, calcium sulphate and magnesium carbonate. Very rarely are the algal cells preserved in the stromatolites and these are microscopic. Stromatolites are essentially trace fossils and these ones are 2650 to 2750 million years old and very abundant. Based on the nature of the proposed development, construction activities may impact on fossil heritage should these features be preserved within the development footprint. The geological structures of the project site suggest that the rocks are much too old to contain fossils other than blue-green algae. Taking account of the defined criteria, the potential impact to fossil heritage resources is negligible to extremely low.

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

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	Contractor in consultation with Heritage Specialist	Pre-construction
A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.	Contractor ECO Heritage specialist	Pre-construction Construction

[3] Graves are subterranean in nature and might not have been identified during the initial site visit undertaken by the specialist.

Mitigation: Action/control	Responsibility	Timeframe
Contractors must be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow if they find sites. All staff should also be familiarised with procedures for dealing with heritage objects/sites.	Contractor, ESA and heritage specialist	Duration of contract, particularly during excavations
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	Heritage Specialist	Pre-construction
Project employees and any contract staff must maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Contractor	Duration of contract
In the event that fossils resources are discovered during excavations, immediately stop excavation in the vicinity of the potential material. Mark (flag) the position and also spoil that may contain fossils. Inform the site foreman and the EO. EO to inform the developer, the developer contacts the standby archaeologist and/or palaeontologist. EO to describe the occurrence and provide images by email.	Contractor and EO	Construction
If any evidence of archaeological sites or remains (e.g. remnants of stone-make structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 540) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 35(3) and 36(6) of the NHRA. A professional archaeologist or paleontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or paleontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.	Contractor and ECO Heritage Specialist	Construction
If concentrations of archeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigations / excavation can be undertaken.	Contractor and ECO Heritage Specialist	Construction

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

OBJECTIVE 19: Appropriate handling and management of waste

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

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

An integrated Waste Management Plan is attached as **Appendix H**.

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

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Waste disposal at the construction site must be avoided by separating and trucking out of waste.	Contractor	Construction
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	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
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.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste must be removed at least weekly for disposal, if feasible; other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Slips of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered landfill site.	Contractor	During and post construction.
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	Contractor	Duration of contract
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Daily inspection of all chemical toilets and septic tanks must be performed by environmental representatives on site.	Contractor	Duration of contract
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste.	Contractor	Duration of construction
Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	Contractor	Duration of construction
Under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor	Duration of construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the materials re-used for an appropriate purpose.	Contractor	Completion of construction
Upon the completion of construction, all sanitation facilities (including chemical toilets) must be removed, as well as the associated waste to be disposed of at a registered waste disposal site.	Contractor	Completion of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » Proof of disposal of sewage at an appropriate wastewater treatment works. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

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

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

Project Component/s	» Laydown areas. » Subcontractors' camps. » Temporary hydrocarbon and chemical storage areas.
Potential Impact	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers. » Soil pollution.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon spills by vehicles and machinery during levelling, vegetation clearance and transport of workers, materials and equipment and fuel storage tanks. » Accidental spills of hazardous chemicals. » Polluted water from wash bays and workshops. » Pollution from concrete mixing and damaged PV panels.

Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. » Prevent and contain hydrocarbon leaks. » Undertake proper waste management. » Store hazardous chemicals safely in a bunded area.

Mitigation: Action/Control	Responsibility	Timeframe
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation.	Contractor	Pre-construction and implement for duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard standing.	Contractor	Construction Operation
Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to: » Designated area; » All applicable safety signage; » Firefighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents.	Contractor	Pre-construction and implement for duration of Contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required, a NEMA Section 30 report must be submitted to DFFE within 14 days of the incident.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.		
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
must take place, an appropriate drip tray must be used to contain any fuel or oils.		
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	Contractor	Construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping. » Safe storage of hazardous chemicals. » Proper waste management.
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMPr. » On-going visual assessment to detect polluted areas and the application of clean-up and preventative procedures. » Monitor hydrocarbon spills from vehicles and machinery during construction continuously and record volume and nature of spill, location and clean-up actions. » Monitor maintenance of drains and intercept drains weekly. » Analyse soil samples for pollution in areas of known spills or where a breach of containment is evident when it occurs.

	» Records of accidental spills and clean-up procedures and the results thereof must be audited on an annual basis by the ECO. » Records of all incidents that caused chemical pollution must be kept and a summary of the results must be reported to management annually.

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

Project component/s	Construction activities and human presence.
Potential Impact	Disturbance of faunal communities due to construction as well as poaching and hunting risk from construction staff.
Activity/risk source	Habitat transformation during construction, site fencing, and the presence of construction and operation personnel.
Mitigation: Target/Objective	Low faunal impact during construction and operation.

Mitigation: Action/control	Responsibility	Timeframe
Environmental induction must be given to all staff regarding the impacts on fauna and avifauna.	Contractor	Construction and Operation
Apply systematic reflective/dynamic markers to the boundary fence to increase the visibility of the fence for approaching birds (e.g. korhaan taxa) and to avoid potential bird collisions with the fence structure.	Contractor	Construction
Concentrate all surface infrastructure on habitat of medium to low avifaunal sensitivity.	Contractor	Construction
Where possible, all internal electrical reticulation should be placed underground, while the alignment of the power line and substation should be placed parallel to existing lines, as far as possible.	Contractor	Construction
Where possible, retain a dense bush clump habitat as part of an open space system to provide refugia and perching platforms for "bushveld" bird species.	Contractor	Construction
EO to monitor and enforce ban on hunting, collecting or harvesting etc. of all plants and animals or their products.	EO	Construction and Operation
All construction vehicles must adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction
Apply bird deterrent devices at selective areas (for example at the corners and middle part of the facility) to the PV panels to discourage birds from colonising the infrastructure or to discourage birds from constructing nests. These could include visual or bio-acoustic deterrents such as highly reflective rotating devices, anti-perching devices such as bird guards, scaring or chasing activities involving the use of trained dogs or raptors and/or netting.	Contractor	Construction
All new power lines should be fitted with bird flight diverters.	Contractor	Construction
Insulate live components at support structures.	Contractor	Construction

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

OBJECTIVE 22: Effective management of concrete batching plants

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

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

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

Mitigation: Action/control	Responsibility	Timeframe
Water should be reused in the concrete batching process, where possible.		
A contaminated stormwater system must be specifically designed for the batching plant to ensure effective control of contaminated stormwater originating from the batching plant and prevent contamination to the surrounding environment.	Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction phase
Artificial wind barriers must be installed around the batching plant to minimise air, land and water pollution. Wind barriers must enclose the entire batching plant and not allow fly ash and other dusts from moving through the barrier. The artificial barrier must be maintained daily for any defects and corrected when necessary.	Contractor	Pre-construction/ construction
The concrete wash bay structure must be constructed in a double brick arrangement or be reinforced to maintain its integrity throughout operation.	Contractor	Construction phase

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

OBJECTIVE 23: Enhancement of positive social impacts and mitigation of negative social impacts

During the construction phase of Lichtenburg 1, both positive and negative impacts are expected to occur. Positive impacts can be enhanced through the application of enhancement measures and negative impacts can be mitigated and the significance reduced through the application of mitigation measures.

Project component/s	» Construction of Lichtenburg 1 and the associated infrastructure
Potential Impact	» Opportunities and benefits associated with the creation of local employment and skills development to be maximised. » Potential local economic benefits. » Population changes resulting in additional pressure on resources, service delivery, infrastructure maintenance and social dynamics during the construction phase as a result of an influx of construction workers into the area. » Decline on local economic and social infrastructure and services as well as a rise in social conflicts from an influx of jobseekers.

	» Increase in traffic disruptions, safety hazards, and impacts on movement patterns of local community as well as impact on private property due to the upgrade of the existing road and heavy vehicle traffic in the local area. » Intrusion impacts could impact the area's "sense of place". » Heavy vehicles and construction activities can generate noise and dust impacts. » Increase in crime due to influx of non-local workforce and jobseekers into the area.
Activity/risk source	» Construction activities. » Construction procurement practice employed by the EPC Contractor. » Developers investment and procurement plans. » Influx of construction workers and jobseekers. » Construction activities affecting daily living and movement patterns. » Safety and security risks associated with construction activities.
Mitigation: Target/Objective	» The developer should aim to fill as many of the low-skilled and semi-skilled positions from the local area as possible. This should also be made a requirement for all contractors. » Increase in the procurement of goods and services, especially within the local economy. » To avoid or minimise the potential impact on local infrastructure, services and local communities and their livelihoods. » To avoid and minimise the potential noise and dust impacts associated with construction activities.

Mitigation: Action/control	Responsibility	Timeframe
Employ local contractors that are compliant with Broad Based Black Economic Empowerment (B-BBEE) criteria, as much as possible.	Developer Contractor	Construction
Adopt a local employment policy to maximise the opportunities made available to the local labour force.	Developer Contractor	Construction
In the recruitment selection process, a minimum percentage of women must be employed	Developer Contractor	Pre-construction Construction
Set realistic local recruitment targets for the construction phase.	Developer Contractor	Construction
Source as much goods and services as possible from the local area. Engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.	Developer Contractor	Construction
Implement a grievance and communication system for community issues and appoint a Community Liaison Officer (CLO) for implementing the grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community and landowners to express any complaints or grievances with the construction process.	Contractor	Construction
A 'locals first' policy should be utilised for employment opportunities, especially for semi and low-skilled job categories.	Contractor	Construction
Working hours must be kept during daylight hours as far as possible during the construction phase, and / or as any deviation that is approved by the relevant authorities.	Contractor	Construction
Implement penalties for drivers of heavy vehicles for reckless driving or speeding as a way to enforce compliance with traffic rules.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Infrastructure such as fencing and gates along access routes must be maintained in the present condition or repaired if disturbed due to construction activities.	Contractor	Construction
Ensure roads utilised are either maintained in the present condition or restored if disturbed from construction activities.	Contractor	Construction
Limit noise generating activities to normal daylight working hours and avoid undertaken construction activities on weekends and public holidays.	Contractor	Construction
The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays and holiday periods where feasible.	Contractor	Construction
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport building materials are fitted with tarpaulins or covers.	Contractor	Construction
Communication, complaints and grievance channels must be implemented and contact details of the CLO are to be provided to the local community.	Contractor	Construction

Performance Indicator	» Employ as much local semi and unskilled labour as possible given the number of positions available. » Local goods and services are purchased from local suppliers where feasible. » Community Liaison Officer is appointed. » Ensure no recruitment takes place on site. » Control/removal of loiters. » Vehicles are roadworthy, inspected regularly and speed limits are adhered to. » Ensure that there are traffic warning signs along access roads, and ensure that these are well illuminated (especially at night). » Roads and electric fencing are maintained or improved upon if disturbed from project activities. » Limit noise generating activities. » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase. » Enforcement of strict speeding limits. » CLO available for community grievances and communication channel. » The construction site is appropriately secured with a controlled access system.
Monitoring	» The Developer and Contractor must keep a record of local recruitments and information on local labour to be shared with the Environmental Control Officer (ECO) for reporting purposes.

6.3 Detailing Method Statements

OBJECTIVE 24: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this 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 and ECO.

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

- Responsible person/s;
- Construction procedures;
- Materials and equipment to be used;
- Getting the equipment to and from site;
- How the equipment/material will be moved while on-site;
- How and where material will be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Timing and location of activities;
- Compliance/non-compliance with the Specifications; and
- Any other information deemed necessary by the Site Manager.

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

- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.
- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- Stormwater method statement.
- Ablution facilities (placement, maintenance, management and servicing).

- Solid Waste Management:
  - Description of the waste storage facilities (on site and accumulative).
  - Placement of waste stored (on site and accumulative).
  - Management and collection of waste process.
  - Recycle, re-use and removal process and procedure.
- Liquid waste management.
- Design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into the surrounding environment. Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure no seepage into the surrounding environment occurs.
- Dust and noise pollution:
  - Describe the 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 and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
  - Lists of all potentially hazardous substances to be used.
  - Appropriate handling, storage and disposal procedures.
  - Prevention protocol of accidental contamination of soil at storage and handling areas.
  - All storage areas, (i.e. for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- Fire prevention and management measures on site.
- Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
  - Rehabilitation, re-vegetation process and bush clearing.
- Incident and accident reporting protocol.
- General administration
- Designate access road and the protocols while roads are in use.
- Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager (with input from the ECO), 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.

6.4 Awareness and Competence: Construction Phase

OBJECTIVE 25: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

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

The Contractors obligations in this regard include the following:

- All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
- The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity are to have copies of the relevant Method Statements and be aware of the contents thereof.
- Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff are aware of the location and have access to the document. Senior site staff will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training session. The training session must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
    - Records must be kept of those that have completed the relevant training.
    - Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
    - Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.
- All sub-contractors must have a copy of the EMPr and sign a declaration/ acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
- Contractors and main sub-contractors should have a basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
- Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- Ensuring that employee information posters, outlining the environmental “do’s” and “don’ts” (as per the environmental awareness training course) are erected at prominent locations throughout the site.

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

6.4.1 Environmental Awareness and Induction Training

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

As a minimum, induction training should include:

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

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

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

6.4.2 Toolbox Talks

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

6.5 Monitoring Programme: Construction Phase

OBJECTIVE 26: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, the Developer will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/ Project Manager will ensure that the monitoring is conducted and reported.

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

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

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

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

6.5.1. Non-Conformance Reports

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

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

6.5.2. Monitoring Reports

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

6.5.3. Audit Reports

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

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

6.5.4. Final Audit Report

A final environmental audit report must be compiled by an independent auditor and be submitted to DFFE upon completion of the construction and rehabilitation activities, within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION

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

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

7.1. Objectives

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

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Implement revegetation and rehabilitation plan (**refer to Appendix D**).	Contractor	Following execution of the works
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these must be cleaned up.	Contractor	Following completion of construction activities in an area

Mitigation: Action/Control	Responsibility	Timeframe
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction equipment camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked. The temporary access roads must be rehabilitated.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
All areas of disturbed soil must be reclaimed using only indigenous grass and shrubs.	Contractor	Following completion of construction activities in an area
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation.	Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated as soon as possible after construction and local indigenous plants must be used to enhance the conservation of the existing natural vegetation on site.	Contractor	Following completion of construction activities in an area
Where disturbed areas are not to be used during the operation of the proposed power line and on-site substation, these areas must be rehabilitated/re-vegetated with appropriate natural indigenous vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist, as applicable. No exotic plants must be used for rehabilitation purposes.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Disturbed areas containing no infrastructure and hard surfaces must be rehabilitated with natural vegetation as soon as possible to avoid the potential of erosion and invasion with alien plants. The area should be monitored (responsibility of EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Proponent in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as areas with steep slopes.	Proponent in consultation with EO and rehabilitation specialist (if required)	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Proponent	Post-rehabilitation
Weeding:	Contractor/ Developer	Construction/ Operation

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

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

CHAPTER 8: OPERATION MANAGEMENT PROGRAMME

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

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

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

8.1. Objectives

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

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

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

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

The **Technical/SHEQ Manager** will:

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

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

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

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

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

It may be necessary to routinely trim vegetation growing between the PV panel rows and/or the plant screens planted along the development site fencing. This is to avoid shading of the panels and reduce fire risks.

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

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbed areas should the previous attempt be unsuccessful.	O&M Contractor	Operation
Any vegetation clearing that needs to take place as part of the maintenance activities must be done in an environmentally friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.	Contractor	Operation and maintenance
Vehicle movements must be restricted to designated access roads.	O&M Contractor	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (bags, logs), silt fences, storm water catch-pits, and shade nets).	O&M Contractor	Operation
Develop and implement an appropriate stormwater management plan for the operation phase of the power line and on-site substation.	O&M Contractor	Operation
Site access should be controlled and only authorised staff and contractors should be allowed on-site.	O&M Contractor	Operation
Notice boards stating that fauna and flora may not be collected, harvested etc. should be placed at the entrances to the site.	O&M Contractor	Operation
Any maintenance activities should avoid listed plant species and strive to keep the footprint as low as possible.	O&M Contractor	Operation
No herbicides should be used and if vegetation clearing needs to take place, this should be done by hand.	O&M Contractor	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	O&M Contractor	Operation
The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.	O&M Contractor	Operation
A botanist and/or ecologist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis. The monitoring should be undertaken until the rehabilitation is considered adequate and sufficient.	The developer and Specialist	Annual monitoring until successful re-establishment of vegetation in an area
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	O&M Contractor	Operation
Spill kits must be kept on-site.	O&M Contractor	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Developer in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
A faunal/ avifauna incident register must be maintained on site.	O&M Contractor SHEQ Manager	Operation
Implement an animal removal plan to ensure safety of workers and fauna.	O&M Contractor	Operation
Regular monitoring for erosion post-construction to ensure that no erosion problems have developed as a result of the past disturbance.	O&M Contractor	Operation
All declared alien species must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983). There must be an alien species monitoring and eradication program to prevent encroachment of these problem plants for the duration of the operation. The eradication and monitoring program must aim	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
to address alien plant problems within the whole site, not just the development footprint.		
A rehabilitation strategy for alien plant species must be implemented after construction is completed until the desired outcome is reached.	O&M Contractor	Operation
Regular monitoring must be undertaken for alien plant invasion, which is likely to occur in previously disturbed areas or in areas receiving runoff from the hardened surfaces of the infrastructure.	O&M Contractor	Operation
The washing of panels during maintenance must be done with biodegradable soaps to avoid soil contamination and the poisoning of small animals.	O&M Contractor	Operation
Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities must be removed to a safe location.	O&M Contractor	Operation

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

OBJECTIVE 3: Protection of avifauna from collision and electrocution

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Post-construction surveys during operation with a minimum of 2 surveys of 3 days in extent during a six month period (including the peak wet season) must be undertaken. The surveys aim to obtain mortality data from birds colliding with the panels to	Avifauna Specialist	Operation

Mitigation: Action/Control	Responsibility	Timeframe
advise on appropriate mitigation measures to be implemented to reduce potential bird mortalities. The surveys should be conducted in a regular and systematic manner by means of direct observations and carcass searches. A management programme must be compiled to assess the efficacy of applied mitigation measures and consult or change measures to reduce on-going mortalities when detected. Additional mitigation measures must be tested or applied, especially if mortalities include birds of prey and species of conservation concern.		
The post-construction monitoring must quantify mortalities (especially vulture mortalities) caused by the power line network. The information could then be used to inform the electrical infrastructure mortality incident register. Monitoring must be implemented once a month for at least one year. All searches should be done on foot. A management programme must be compiled to assess the efficacy of applied mitigation measures and consult or change measures to reduce on-going mortalities when detected. Additional mitigation measures must be tested or applied, especially if mortalities include birds of prey and species of conservation concern.	Avifauna Specialist	Operation
Any electrocution and collision events that occur should be recorded, including the species affected and the date. If repeated collisions occur within the same area, then further mitigation and avoidance measures may need to be implemented.	O&M Contractor	Operation
Bird nests must be removed when nest-building attempts are noticed.	O&M Contractor	Operation
Reduce or minimise the use of outdoor lighting to avoid attracting birds to the lights or to reduce potential disorientation to migrating birds.	O&M Contractor	Operation
Report avifauna mortalities (number locality and species) to the Electrical Energy Mortality Register at the Endangered Wildlife Trust.	O&M Contractor	Operation

Performance Indicator	» Minimal collision, or electrocution events. » Reduced statistical detection/observation of bird mortalities.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitude for mortalities.

OBJECTIVE 4: Minimise soil degradation, erosion and alien plant invasion

The soil on site may be impacted in terms of:

» *Soil degradation including erosion* - by wind and water and subsequent deposition elsewhere is of a concern across the entire site.

» *Uncontrolled run-off* - relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems outside of the project site during operation.
» *Degradation* - of the natural soil profile due to pollution.

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

Mitigation: Action/Control	Responsibility	Timeframe
Ensure dust control on site through wetting of denuded areas or the use of an appropriate dust suppression measure.	O&M Contractor	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	O&M Contractor	Operation
Control depth of excavations and stability of cut faces/sidewalls.	O&M Contractor	Operation
Regular monitoring by the operation and maintenance team for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring.	O&M Contractor	Operation

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

OBJECTIVE 5: Minimise dust and air emissions

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

Project Component/s	» Hard engineered surfaces. » On-site vehicles.

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

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

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

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

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

» Alien Invasive species should be completely eradicated in order to decrease the fire risk associated with the site.
» Cigarette butts may not be thrown in the veld, but must be disposed of correctly. Designated smoking areas must be established with suitable receptacles for disposal.
» In case of a fire outbreak, contact details of the local fire and emergency services must be readily available.
» Contractors must ensure that basic firefighting equipment is available on site as per the specifications defined by the health and safety representative / consultant.
» The fire risk on site is a point of discussion that must take place as part of the environmental induction training prior to commencement of construction.

» The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection.

The following below can be used as a guide for appropriate fire management (also refer to **Appendix I**):

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

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate firefighting equipment on site and establish a firefighting management plan during operation (**refer to Appendix I**).	O&M Contractor	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Contractor	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Contractor	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Contractor	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Contractor	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Contractor	Operation
Road borders must be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.	O&M Contractor	Operation
Staff and general trips to the site should occur outside of peak traffic periods.	O&M Contractor	Operation
Should panels be required to be replaced, the following will apply: » Materials and panels are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur. » Full clean-up of all materials must be undertaken after the removal and replacement of the solar panel arrays and associated infrastructure is complete, and disturbed areas appropriately rehabilitated. » Most of the materials used for solar panel systems can be recycled. The majority of the glass and semiconductor materials can be recovered and re-used or recycled. Recyclable materials must be transported off-site by truck and managed at appropriate facilities in accordance with	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
relevant waste management regulations. No waste materials may be left on-site. » Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.		

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

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

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

The operations at the PV facility is not anticipated to have severe negative impacts on the neighbouring farmers' living and movement patterns, apart from a limited increase in the movement of people to and from the site, as well as the presence of these employees on-site on a permanent basis.

Vehicle movement to and from the site (e.g. transportation of workers and goods) could influence road users' daily movement patterns, although it is anticipated that this impact would only materialise intermittently.

Project Component/s	» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners. » Impact on farming activities on site.
Potential Impact	» Possible limited intrusion impact on surrounding landowners. » Visual impact of facility degradation and vegetation rehabilitation failure.
Activities/Risk Sources	» Traffic to and from site could affect daily living and movement patterns of surrounding residents. » Viewing of the facility by observers in a negative light due to degradation and rehabilitation failure.
Mitigation: Target/Objective	» Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities. » Well maintained and neat facility.

Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	Contractor and Security Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movement to and from the site should be minimised as far as possible.	Contractor and Security Contractor	Operation
Infrastructure such as fencing and/or gates must be maintained in the present condition or repaired if disturbed due to project activities.	O&M Contractor	Operation
Maintain the general appearance of the facility as a whole, including the PV panels, servitudes and the ancillary structures.	O&M Contractor	Operation
Maintain roads and servitudes to forego erosion and to suppress dust.	O&M Contractor	Operation
Monitor rehabilitated areas, and implement remedial action as and when required.	O&M Contractor	Operation

Performance Indicator	» No environmental pollution occurs (i.e. waste, water, and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities in surrounding areas. » Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.
Monitoring	» The O&M operator should be able to demonstrate that the facility is well managed without environmental pollution and that the above requirements have been met. » Monitoring of the entire site on an ongoing basis (by the O&M operator)

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

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

Project Component/s	» On-site substation. » PV facility. » Operation and maintenance staff. » Workshop / control room.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	» Substation, transformers, switchgear and supporting equipment. » Workshop / control room.
Mitigation: Target/Objective	» Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

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

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	» Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the O&M operator. » All appropriate waste disposal certificates accompany the monthly reports.

OBJECTIVE 9: Enhancement of positive social impacts and mitigation of negative social impacts

During the operation phase of Lichtenburg 1, both positive and negative impacts are expected to occur. Positive impacts can be enhanced through the application of enhancement measures and negative impacts can be mitigated and the significance reduced through the application of mitigation measures.

Project Component/s	»	Operational PV facility
Potential Impact	»	Loss of opportunities to stimulate production and employment of the local economy
Activity/Risk Source	»	Labour practices employed during operation
Mitigation: Target/Objective	»	Maximise local community employment benefits in the local economy

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Adopt a local employment policy to maximise the opportunities made available to the local labour force.	O&M operator	Operation
Establish vocational training programs for the local labour force to promote the development of skills	O&M operator	Operation

Performance Indicator	»	Percentage of workers that were employed from local communities » Number of people attending vocational training on an annual basis
Monitoring	»	The O&M operator must keep a record of local recruitments and information on local labour for reporting purposes

CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING

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

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

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

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

9.1. Objectives

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

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

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

9.2. Approach to the Decommissioning Phase

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

Two possible scenarios for this decommissioning phase are detailed below:

SCENARIO 1: TOTAL DECOMMISSIONING OF PV FACILITY.

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

- All concrete and imported foreign material must be removed from the PV facility i.e. panels, support structures etc.;
- The holes where the panel support structures are removed must be levelled and covered with subsoil and topsoil;
- Infrastructure not required for the post-decommissioning use of the site must be removed;
- Access roads and servitudes not required for the post-decommissioning use of the site must be rehabilitated. If necessary, an ecologist should be consulted to give input into rehabilitation specifications;
- Tracks that are to be utilised for the future land use operations should be left *in-situ*. The remainder of the tracks to be removed (ripped) and topsoil replaced;
- All ancillary buildings and access points are to be removed unless they can be used for the future land use;
- The underground electric cables are to be removed if they cannot be used in the future land use;
- All material (cables, PV Panels etc.) must be re-used or recycled wherever possible;
- The competent authority may grant approval to the owner not to remove the landscaping and underground foundations;
- The site must be seeded with locally sourced indigenous vegetation to allow revegetation of the site; and
- Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.

SCENARIO 2: PARTIAL DECOMMISSIONING OF ENERGY FACILITY.

Should more advanced technology become available it may be decided to continue to use the site as a PV facility. Much of the existing infrastructure is likely to be re-used in the upgraded facility. In this case, all infrastructure that will no longer be required for the upgraded facility must be removed as described for scenario 1. The remainder of the infrastructure should remain in place or upgraded depending on the requirements of the new facility. Any upgrades to the facility at this stage must comply with relevant legislation.

9.2.1. Identification of structures for post-closure use

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

9.2.2. *Removal of infrastructure*

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

9.2.3. *Soil rehabilitation*

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

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

9.2.4. *Establishment of vegetation*

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

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

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

9.2.5. *Maintenance*

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

9.2.6. *Monitoring*

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

The following items should be monitored continuously:
- Erosion status;
- Vegetation species diversity; and
- Faunal re-colonisation