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# KIARA PV2 FACILITY AND ASSOCIATED INFRASTRUCTURE, NORTH WEST PROVINCE

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## ENVIRONMENTAL MANAGEMENT PROGRAMME

January 2023

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## PROJECT DETAILS

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<b>DFFE Reference</b>	:	14/12/16/3/3/2/2172
<b>Title</b>	:	Environmental Impact Assessment Process Environmental Management Programme: Kiara PV2 Facility, North West Province
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## DEFINITIONS AND TERMINOLOGY

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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.

**Disturbance 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 Environment, Forestry and Fisheries) 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 (EMPr):** 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.

**Environmental Officer (EO):** The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

**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 (I&AP):** 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

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

AIA	Archaeological Impact Assessment
BGIS	Biodiversity Geographic Information System
CDSM	Chief Directorate Surveys and Mapping
CEMP	Construction Environmental Management Plan
DFFE	Department of Environment, Forestry and Fisheries
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
KOP	Key Observation Point
kV	Kilo Volt
LUDS	Land Use Decision Support
LUPO	Land Use Planning Ordinance
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NID	Notice of Intent to Develop
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
NWDEDECT	North West Department of Economic Development, Environment, Conservation and Tourism
PIA	Paleontological Impact Assessment
PM	Post Meridiem; "Afternoon"
SACAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
SMME	Small, Medium and Micro Enterprise

SAPD

South Africa Police Department



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## CHAPTER 1: INTRODUCTION

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Voltalia South Africa (Pty) Ltd is proposing the development of a commercial photovoltaic (PV) solar energy facility and associated infrastructure on a site located approximately 16km north-east of the town of Lichtenburg, within the Ditsobotla Local Municipality and the Ngaka Modiri Molema District Municipality in the North West Province (refer to **Figure 1**). The facility will have a contracted capacity of up to 120MW and will be known as the Kiara PV2 Facility. The project is planned as part of a larger cluster of renewable energy projects, which include six (6) additional PV facilities, each up to 130MW (known as the Kiara PV1, Kiara PV3, Kiara PV4, Kiara PV5 and Kiara PV6 and Kiara PV7) and grid connection infrastructure connecting the facilities to the existing Watershed Substation (refer to **Figure 2**). These projects are proposed by separate Specialist Purpose Vehicles (SPVs)<sup>1</sup>, and are assessed through separate Environmental Impact Assessment (EIA) processes.

From a regional perspective, the North West Province, and particularly the area under investigation, is considered favourable for the development of a commercial solar facility by virtue of prevailing climatic conditions, relief, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid) and the availability of land on which the development can take place.

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 employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. In terms of the Duty of Care provision in S28(1) of NEMA, 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. The document must therefore 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 for the project.

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<sup>1</sup> The development of the various projects under separate SPVs is in accordance with the DMRE's requirements under the REIPPPP.

## CHAPTER 2: PROJECT DETAILS

Voltalia South Africa (Pty) Ltd is proposing the development of a commercial photovoltaic (PV) solar energy facility and associated infrastructure on a site located approximately 16km north-east of the town of Lichtenburg, within the Ditsobotla Local Municipality and the Ngaka Modiri Molema District Municipality in the North West Province (refer to **Figure 1.1**). The facility will have a contracted capacity of up to 120MW and will be known as the Kiara PV2 Facility.

### 2.1 Project Site

**Table 2.1** provides information regarding the proposed project site identified for the Kiara PV2 Facility

**Table 2.1 A description of the project site identified for the Kiara PV2 Facility**

<b>Province</b>	<b>North West Province</b>	
<b>District Municipality</b>	Ngaka Modiri Molema District Municipality	
<b>Local Municipality</b>	Ditsobotla Local Municipality	
<b>Ward Number (s)</b>	Ward 16	
<b>Nearest town(s)</b>	Lichtenburg (~16km south-east)	
<b>Farm name(s) and number(s) of properties affected by the Solar PV Facility</b>	Farm Hollaagte No. 8	
<b>Farm Portion(s), Name(s) and Number(s) associated with the PV Facility</b>	Portion 2 of the Farm Hollaagte No. 8	
<b>SG 21 Digit Code (s) for all properties</b>	TOIP0000000000800002	
<b>Current zoning</b>	Agricultural (grazing of cattle)	
<b>Current land use</b>	Grazing (mainly cattle)	
<b>Site Extent (Study Area)</b>	~ 856.5 ha	
<b>PV Development Area</b>	~169ha	
<b>Site Coordinates (four corner coordinate points of the project site)</b>	<b>Latitude:</b>	<b>Longitude:</b>
	26°01'23.47"S	26°16'44.90"E
	26°01'18.77"S	26°17'20.55"E
	26°01'53.58"S	26°17'33.64"E
	26° 02'16.84"S	26°16'57.37"E

A locality map illustrating the location of the Kiara PV2 Facility is provided in **Figure 1**.

### 2.2 Project Description

The facility will have a contracted capacity of up to 120MW and will include the following infrastructure:

- » Solar PV array comprising PV modules and mounting structures
- » Inverters and transformers
- » Cabling between the panels

- » 132kV onsite facility substation from the onsite substation to the switching collector substation
- » Cabling from the onsite substation to the collector substation (either underground or overhead).
- » Electrical and auxiliary equipment required at the collector substation that serves the solar energy facility, including switchyard/bay, control building, fences, etc.
- » Battery Energy Storage System (BESS)
- » Site and internal access roads (up to 8m wide)
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary and permanent laydown area

A layout map of the Kiara PV2 Facility is provided in **Figure 2**

A summary of the planned infrastructure proposed as part of Kiara PV2 Facility is provided in **Table 2.3** and described in more detail under the sub-headings below.

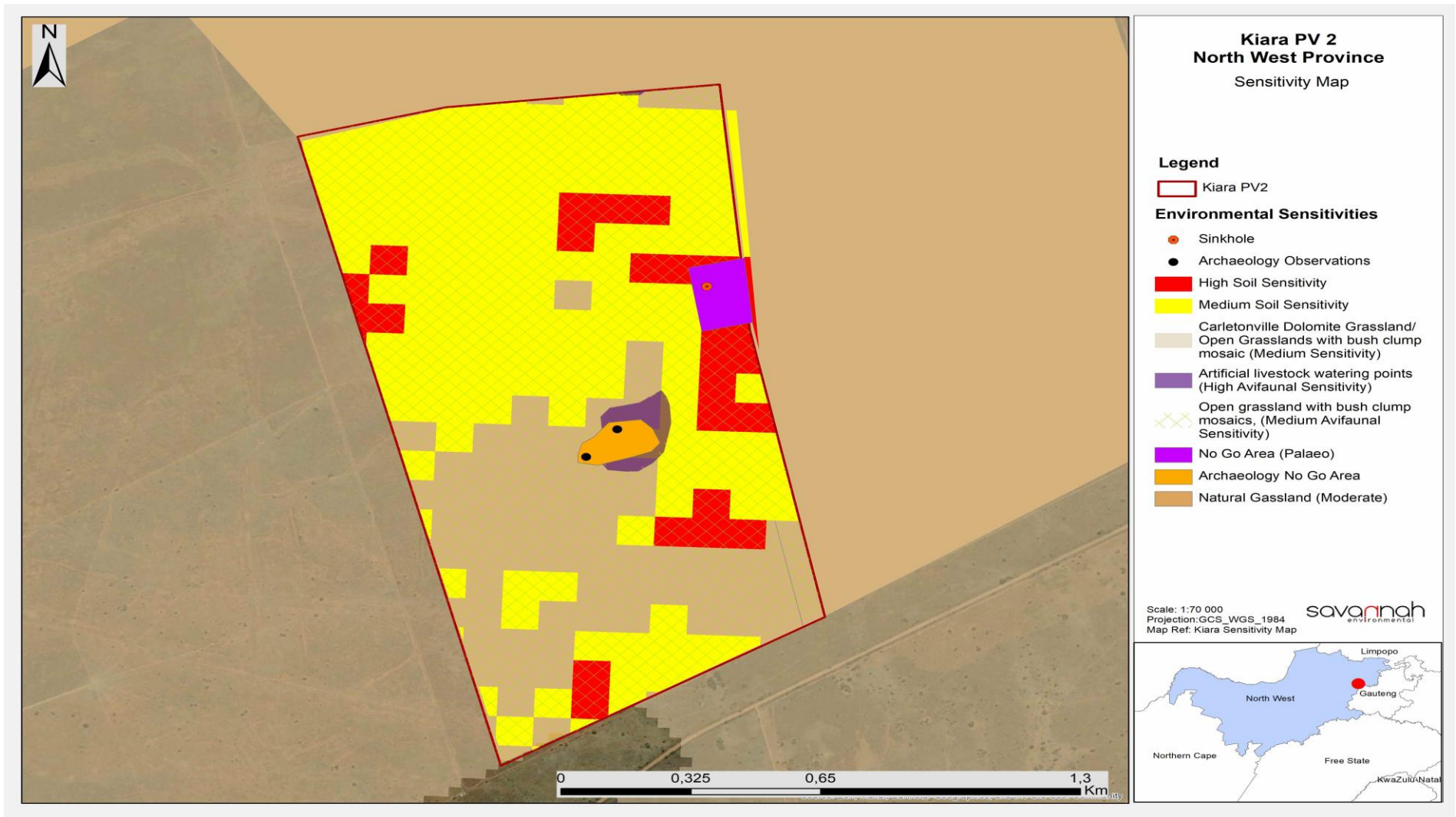
**Table 2.3:** Planned infrastructure proposed as part of the Kiara PV2 Facility

Infrastructure	Footprint and dimensions
Number of Panels	~183 720
Panel Height	Up to 5m from ground level
Technology	Use of fixed-tilt, single-axis tracking, and/or double-axis tracking PV technology. Monofacial or bifacial panels are both considered.
Battery Energy Storage System (BESS)	BESS area: ~8m <sup>2</sup> Maximum Volume: 1740 m <sup>3</sup>
Other infrastructures	Operations building – 20m x 10m = 200m <sup>2</sup> Workshop – 15m x 10m = 150m <sup>2</sup> Stores - 15m x 10m = 150m <sup>2</sup>
Area occupied by laydown area	Temporary Laydown Area: 220m x 100m
Contracted Capacity	Up to 120MW
Area occupied by the solar array	1690m <sup>2</sup>
Area occupied by the substations	Facility substation: Up to 1ha Eskom switching station: Up to 3ha
Access and internal roads	Wherever possible, existing access roads will be utilised to access the project site and development area. It is unlikely that access roads will need to be upgraded as part of the proposed development. Main access road to the project site will be via the existing R52 gravel road. Internal access roads (gravel) of up to 6m in width will be required to access the PV facility.
Grid connection	The 33/132kV on-site substation will be connected to the proposed central collector substation via overhead/underground cabling with a capacity of up to 132kV. A new 275kV single- or double-circuit power line will run from the central collector substation and tie into the existing Watershed MTS. The switching station forming part of the 132kV collector substation and the new 275kV single-or double circuit power line will be assessed as part of a separate Environmental Impact Assessment process in support of an application for Environmental Authorisation.
Temporary infrastructure	Temporary infrastructure, including laydown areas, hardstand areas and a concrete batching plant, will be required during the construction phase. All areas affected by temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.









**Figure 2:** Sensitivity map of the development footprint and grid connection corridor for the Kiara PV2 Facility, as was assessed as part of the EIA process.

## **2.3. Life-cycle Phases of Kiara PV2 Facility**

A series of activities are proposed as part of the design, pre-construction, construction, operation, and decommissioning phases associated with the development of the Kiara PV2 Facility. These are discussed in more detail under the respective sub-headings below.

### **2.3.1. Design and Pre-Construction Phase**

#### **Planning**

Several post-authorisation factors are expected to influence the final design of the solar energy facility and could result in small-scale modifications of the PV array and/or associated infrastructure. An objective of the Engineering, Procurement and Construction (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 however, 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. Should there be any substantive changes or deviations from the original facility layout of the project, the DFFE will be notified and where relevant, the final facility design approved by the DFFE.

#### **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, on-site facility substation and the associated infrastructure) and a geotechnical survey. Geotechnical surveys acquire information regarding the physical characteristics of soil and rocks underlying a proposed project site and inform the design of earthworks and foundations for structures.

### **2.3.2. Construction Phase**

The construction phase will take approximately 15 - 18 months to complete, and will entail a series of activities including:

#### **Procurement and employment**

At the peak of construction, the project is likely to create a maximum of 200 employment opportunities. These employment opportunities will be temporary and will last for a period of approximately 15 – 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 high levels of unskilled and semi-skilled labour so there will be good opportunity to use local labour, where available. Employment opportunities 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, with a man camp housing the employees during the construction phase.

#### **Establishment of an Access Road**

Wherever possible, existing access roads will be utilised to access the project site and development area. It is unlikely that access roads will need to be upgraded as part of the proposed development. Main access road to the project site will be via the existing R52 gravel road. Internal access roads (gravel) of up to 6m in width will be required to access the PV facility.

### **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. 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)<sup>2</sup> by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the project 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 on-site facility 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. It is anticipated that the temporary laydown area will be included within development footprint of the solar energy facility.

### **Erect PV Panels and Associated Infrastructure**

The construction phase involves installation of the PV solar panels, structural and electrical infrastructure required for the operation of Kiara PV2 Facility. In addition, preparation of the soil and improvement of the access roads are likely to continue for most of the construction phase. For PV array installations, vertical support posts will be 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/piles could be used. The posts will hold the support structures (tables) on which the PV modules would be mounted. Brackets will attach the PV modules to the tables. Trenches are to be dug for the underground AC and DC cabling, and the foundations of the inverter enclosures and transformers will be prepared. While cables are being laid and combiner boxes are being installed, the PV tables will be erected. Wire harnesses will connect the PV modules to the electrical collection systems. Underground cables and overhead circuits will connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure, and ultimately the on-site facility substation.

The BESS will be constructed as part of the PV array and will require a survey of the footprint, site clearing and levelling. For Lithium-ion batteries, the battery cell packs (containing an electrolyte solution) will be brought to site as sealed units which will be installed and connected on site. MV cabling will be assembled connecting both the PV array and the BESS to the nearby substation.

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

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<sup>2</sup> A permit will be required in accordance with Section 81 of the National Road Traffic Act (No. 93 of 1996) (NRTA) which pertains to vehicles and loads which may be exempted from provisions of Act.

### **Undertake Site Rehabilitation**

Once construction is completed and all construction equipment has been removed, the development enveloped will be rehabilitated where practical and reasonable. In addition, on full commissioning of Kiara PV2 Facility, any access points which are not required during operation must be closed and rehabilitated accordingly.

#### **2.3.3. Operation Phase**

Kiara PV2 Facility is expected to operate for approximately 20 to 25 years. The facility will operate continuously, 7 days a week, and will include an integrated energy storage system. 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 energy facility, conducting preventative and corrective maintenance, receiving visitors, and maintaining security.

The operation phase will create approximately 15 - 20 full-time equivalent employment positions which will include low-skilled, semi-skilled and skilled personnel. Employees that can be sourced from the local municipal area include the less skilled and semi-skilled personnel (such as safety and security staff and certain maintenance crew). Highly skilled personnel may need to be recruited from outside the local area where these resources are not available within the area.

#### **2.3.4. Decommissioning Phase**

Depending on the continued economic viability of Kiara PV2 Facility following the initial 20 to 25 years operation lifespan, the solar energy facility will either be decommissioned, or the operation phase will be extended. If it is deemed financially viable to extend the operation phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at the time. If the decision is made to decommission the facility, the following decommissioning activities will take place:

### **Site Preparation**

Site preparation activities will 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 energy facility is ultimately decommissioned, the equipment to be removed will depend on the land use proposed for the project site at the time. All above ground facilities that are not intended for future use 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 energy facility would be de-constructed and recycled, or disposed of in accordance with applicable regulatory requirements. The site will be rehabilitated where required and can potentially be returned to a 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 operational lifespan. The solar energy 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 the current land used (i.e. livestock grazing) to resume.

## **2.4 Findings of the Environmental Impact Assessment (EIA)**

No environmental fatal flaws were identified for Kiara PV2 Facility in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of highly sensitive features within the project site by the development footprint and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with Kiara PV2 Facility identified and assessed through the EIA process include:

- » Impacts on ecology, flora and fauna.
- » Impacts on avifauna.
- » Impacts on aquatic ecology
- » Impacts to soils and agricultural potential.
- » Impacts on heritage resources, including archaeology and palaeontology.
- » Visual Impacts.
- » Social impacts.

### **2.4.1 Impacts on Ecology**

The majority of the site still consists of natural grassland which is still in a fairly good condition. Some disturbance is present though in general these are localised or has been able to re-establish a near natural grass layer. The surrounding areas are also largely still natural, and the area is therefore not affected to a large extent by cumulative transformation pressures. However, it is well known that the larger area has been increasingly subjected to applications for solar energy developments and the cumulative impact that this transformation will have will steadily increase over time.

The description of the proposed development area indicates a relatively uniform habitat, with moderate species diversity and largely without any unique habitats or areas of high diversity. Furthermore, the vegetation consists of Carletonville Dolomite Grassland, which although it has a significant species diversity, is currently listed as being of Least Concern (LC) which also does not contribute toward its conservation value. Overall, the vegetation in the study area can therefore not be regarded as exceeding a Moderate level of sensitivity. Areas of localised high conservation value may however still be present. No such areas were identified for the Kiara PV2 Facility development area. The lower-lying drainage area which is considered to have a high conservation value is located to the north of the Kiara PV2 Facility site.

The development footprint for Kiara PV2 Facility therefore contains no areas of high sensitivity which should be avoided by the development. However, the Marico Biosphere Reserve borders the study area to the north. The protected area should remain unaffected by the proposed development but should be consulted during the application process.

The impact significance has been determined and indicates that the majority of impacts will remain moderate such as the impact on protected plant species, the drainage system, infestation by exotic weeds, erosion and habitat fragmentation. If the mitigation measures are adequately implemented, these impacts can be further decreased. However, since the area of development is fairly large and still consists of natural vegetation in a relatively good condition the impact on vegetation and diversity loss as well as the impact on the mammal population will remain high. As such, the PV facility and associated infrastructure would be considered to be acceptable and can therefore be authorised.



### **2.4.2 Impacts on Avifauna**

The assessment area consists of four avifauna habitats; transformed areas, degraded grassland, grassland and bushclumps. These habitats were still mostly in a natural state with the exception of some areas that have been disturbed by livestock grazing and transformed due to anthropogenic activities. Sensitivity of the identified habitats was confirmed to be very low to moderate. Two SCC were confirmed in the assessment area and surrounds Cape Vulture (*Gyps coprotheres*) and Greater Flamingo (*Phoenicopterus roseus*) (which is likely to fly over the assessment area). There is a possibility that additional conservation important and sensitive vulture species occur within the project area. Some high-risk avifauna species were recorded from the project area and surrounds, including both raptors and water birds.

The project will result in habitat loss and degradation of avifaunal habitats. The development will lead to the clearing of vegetation and an altering in the undeveloped nature of the area. Based on the medium receptor resilience and the medium functional integrity, the assessment area was given a medium to low site ecological importance with transformed areas having a very low site ecological importance (SEI).

The development will also lead to sensory disturbance, collision and electrocution risks. Even though the latter three impacts can be effectively mitigated, the loss of habitat cannot be mitigated. Considering the number of applications and current solar plant developments in the area the cumulative impact is regarded as being high.

Mitigation measures that have provided have resulted in the reduction of most impacts to a Moderate or Low, which is considered within the limits of acceptable change. It is the opinion of the specialist that the project may be considered for approval, but all prescribed mitigation measures and monitoring must be considered by the issuing authority. Any power lines that may be developed must be extensively mitigated due to the presence of a vulture restaurant in the vicinity.

### **2.4.3 Soils and Agricultural Potential**

The soil forms present within the project area are mainly of the Mispah soil form, which has a shallow soil depth of between 100-200mm. The area has neither historically nor recently been used for crop production, as confirmed by the field crop boundary data of DALRRD (2019). No irrigation infrastructure, such as centre pivots or drip irrigation, are present within the project area and irrigated agricultural is currently not practiced in the area.

The area is currently used for livestock farming. The proposed Kiara PV 2 development area can support 21 head of cattle at the long-term grazing capacity of 8ha/LSU (DALRRD, 2018). Considering the soil properties, land capability and agricultural potential of the development area, most of the area has low agricultural Sensitivity. Only the small area of 8.1ha where the Hutton soils are present, has medium agricultural Sensitivity. Soil in the project area will have low sensitivity, depending on the successful implementation of mitigation measures to prevent soil erosion, compaction, and pollution.

It is anticipated that the construction and operation of the Kiara PV 2 Facility will have impacts that range from medium to low. Through the consistent implementation of the recommendation mitigation measures, most of impacts can all be reduced to low. It is the specialist's professional opinion that this application be considered favourably, provided that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed development area that will be fenced off.

## **2.4.4 Impacts on Heritage Resources**

### **Archaeology**

No stone age archaeological resources were identified during the field assessment despite the presence of abundant raw material sources. In other nearby projects, Stone Age archaeological resources that were identified were graded as having low levels of scientific significance. As such, it is very unlikely that the proposed development will impact on significant Stone Age archaeological heritage.

A number of stone structures were identified within the study area. These have been categorised as either kraals or ruins of varying heritage value. Where the kraals and ruins form part of a cluster of resources, these have been graded as IIIC for their historical contextual significance and their contribution to the cultural landscape. It is recommended that a no-development buffer of 20m is implemented around these Grade IIIC structures. Where ruins or kraals are isolated on the landscape, their heritage value is limited and as such, these have been graded as Not Conservation-Worthy (NCW).

A number of graves were identified within the areas proposed for development. All the graves are ascribed high local levels of cultural value and as such, are graded IIIA. It is important that human remains are not disturbed through the process of construction of this development.

The clusters of resources have been mapped with their recommended no-go buffer areas in the maps below. In order to conserve the integrity of the relationship between the kraals, ruins and graves, it is recommended that the clusters as mapped below are considered to be no-go areas for the proposed development.

### **Palaeontology**

Geological units within the development area range from very highly sensitive dolomites of the Monte Christo Formation of the Malmani Subgroup to moderately sensitive, recent, alluvium.

Following observations during the field investigation as well as data obtained from previous palaeontological impact assessments in this region, it is our professional opinion that significant stromatolites from the Malmani Subgroup are abundantly present in this area.

The excavations for the construction of the proposed Kiara PV 2 Facility will most probably expose some sediments that are very highly sensitive geological formations and some sites revealed evidence of very highly significant remains of fossils. A significant part of the excavation project will cut into rocks of the Malmani Subgroup, Chuniespoort Group of the Transvaal Supergroup. This unit has a very high sensitivity for palaeontological heritage. Impacts to the sensitive geology can be mitigated through the implementation of the attached Chance Fossil Finds Procedure for the duration of construction activities.

Furthermore, a fossil exposure of grade IIIB heritage significance was identified within the area proposed for the Kiara PV 2 facility. A no-development area has been identified around this sinkhole and this area must be excluded from the proposed development footprint.

### **2.4.5 Visual Impacts**

The construction and operation of the proposed Kiara PV 2 Facility and its associated infrastructure may have a visual impact on the study area, especially within a 1km radius (and potentially up to a radius of 3km) of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility.

The combined visual impact or cumulative visual impact of six additional PV facilities (namely Kiara PV 1, Kiara PV 3, Kiara PV 4, Kiara PV 5, Kiara PV 6, and Kiara PV 7; which will collectively be known as the Kiara PV Cluster) is expected to increase the area of potential visual impact within the region. The intensity of visual impact (number of PV arrays visible) to exposed receptors, especially those located within a 3km radius, is expected to be greater than it would be for a single solar energy facility. The cumulative visual impact is however still expected to be within acceptable limits, due to the limited potential sensitive visual receptors.

Overall, the significance of the visual impacts is expected to range from high to low as a result of the generally undeveloped character of the landscape and the remote location of the project infrastructure. There are a very limited number of potential sensitive visual receptors within a 3km radius of the proposed structures (ie. four (4) homesteads as has been described), although the possibility does exist for visitors to the region to venture into closer proximity to the PV facility structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

A number of mitigation measures have been proposed. Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility.

### **2.4.6 Social Impacts**

Impacts are expected to occur with the development of Kiara PV2 Facility during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

From a social perspective, it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws, and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings can be made:

- » The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focused on the construction of PV facilities and pivot infrastructure (these relate to intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.
- » Employment opportunities will be created in the construction and operation phases and the impact is rated as positive even if only a small number of individuals will benefit in this regard.
- » The proposed project could assist the local economy in creating entrepreneurial development, especially if local businesses could be involved in the provision of general material and services during the construction and operational phases.



- » Capacity building and skills training amongst employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
- » The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society.

The following recommendations are made based on the Social Impact Assessment which included a stakeholder engagement process. The proposed mitigation measures should be implemented to limit the negative impacts and enhance the positive impacts. Based on the social assessment, the following recommendations are made:

- » In terms of employment related impacts, it is important to consider that job opportunities for the unskilled and semi-skilled are scarce commodities in the study area and could create competition among the local unemployed. Introducing an outside workforce will therefore most likely worsen local endeavours to obtain jobs and provoke discontent as well as put pressure on the local services available. Local labour should be utilised to enhance the positive impact of employment creation in the area. Local businesses should be involved with the construction activities where possible. It is imperative that local labour be sourced to ensure that benefits accrue to the local communities. Preference should thus be given to the use of local labour during the construction and operational phases of the project as far as possible.
- » Locals should also be allowed an opportunity to be included in a list of possible local suppliers and service providers, enhancing the multiplier effect. This aspect would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.
- » Impacts associated with the construction period should be carefully mitigated to minimise any dust and noise pollution.
- » Safety and security concerns should be considered during the planning and construction phases of the proposed project.

The proposed project and associated infrastructure will create a number of potential socio-economic opportunities and benefits and is unlikely to result in permanent damaging social impacts. From the specialist's perspective it is concluded that the project is acceptable subject to the implementation of the recommended mitigation and enhancement measures and management actions identified for the project. Considering the findings of the report and potential for mitigation it is the reasoned opinion of the specialist that the project can be authorised from a social perspective.

#### **2.4.6 Cumulative Impacts**

Cumulative impacts are expected to occur with the development of the Kiara PV2 Facility throughout all phases of the project life cycle and within all areas of study considered as part of this EIA report. The main aim for the assessment of cumulative impacts considering the Kiara PV2 Facility is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- » There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes, aquatic systems) due to the development of Kiara PV2 Facility and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- » There will be no unacceptable risk to avifauna with the development of Kiara PV2 Facility and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- » The project will not impact on any high potential agricultural land and will therefore not contribute to impacts on this resource or food security.
- » Change to the sense of place and character of the area is expected with the development of the proposed Kiara PV2 Facility and other renewable energy facilities within a 30km radius of the site. The cumulative impact is however considered to be acceptable provided best practice management measures are implemented.
- » There will be no unacceptable loss of heritage resources associated with the development of Kiara PV2 Facility. The cumulative impact is therefore acceptable.
- » No unacceptable negative social impacts are expected to occur. Positive cumulative impacts are expected to occur from a social perspective as a result of local economic upliftment and employment opportunities. Positive cumulative impacts are expected to be beneficial at a regional level. The cumulative impact is therefore acceptable.

Based on the specialist cumulative assessment and findings, the development of the Kiara PV2 Facility and its contribution to the overall impact of all renewable energy projects to be developed within a 30km radius, it can be concluded that the Kiara PV2 Facility cumulative impacts will be mainly of a medium to low significance, with impacts of a high significance mainly relating to terrestrial biodiversity impacts. Therefore, the development of the Kiara PV2 Facility will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

## **2.5 Environmental Sensitivity**

Taking into consideration the solar resource, proximity to the off-taker and point of interconnection, land availability and suitability, geographical and topographical location, access to road infrastructure and proximity to towns with a need for socio-economic upliftment, the development of the Project within the Development Footprint is considered to be desirable. The Development Footprint within which the facility is proposed is sufficient in extent for the installation of a solar PV facility, while allowing for the avoidance of environmental site sensitivities. Similarly, the power line corridor identified is sufficient for the placement of the power line while allowing for the avoidance of environmental sensitivities. To ensure avoidance of these sensitive environmental features, the facility layout has been optimised by the Project Developer. This approach ensures the application of the mitigation hierarchy (i.e., avoid, minimise, mitigate and offset) to the Kiara PV2 Facility project, which ultimately ensures the avoidance, reduction and/or mitigation of all identified detrimental or adverse impacts on sensitive features as far as possible.

In summary the Environmental sensitivities identified include:

- » Marico Biosphere Reserve borders the study area to the north.
- » Two SCC were confirmed in the assessment area and surrounds Cape Vulture (*Gyps coprotheres*) and Greater Flamingo (*Phoenicopterus roseus*) (which is likely to fly over the assessment area).

- » Kraals and ruins form part of a cluster of resources, these have been graded as IIIC for their historical contextual significance.

## 2.6 Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the Development Footprint proposed by the Project Developer, the avoidance of the sensitive environmental features within the Development Footprint, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Project is acceptable within the landscape and can reasonably be authorised subject to avoidance of the sensitive areas identified through the EIA process and the implementation of recommended mitigation measures. The following project details should be included within the EA for the Project:

- » The Kiara PV2 Facility will have a contracted capacity of up to 120MW and will be located on Portion 2 of the Farm Hollaagte No. 8.

The following infrastructure is to be included within an authorisation issued for the project:

- » Solar PV array comprising PV modules and mounting structures.
- » Inverters and transformers.
- » Cabling between the panels.
- » 132kV onsite facility substation.
- » Cabling from the onsite substation to the collector substation (either underground or overhead).
- » Electrical and auxiliary equipment required at the collector substation that serves the solar energy facility, including switchyard/bay, control building, fences, etc.
- » Battery Energy Storage System (BESS).
- » Site and internal access roads (up to 8m wide).
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary and permanent laydown area.

The following key conditions would be required to be included within an authorisation issued for the Project:

- » All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within **Appendices D to I** are to be implemented.
- » The EMPrs as contained within **Appendix L** and **M** of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the Kiara PV2 Facility and associated infrastructure in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the project is considered key in achieving the appropriate environmental management standards as detailed for this Project.
- » Chance Fossil Finds Procedure must be implemented for the duration of the construction phase of the project.
- » Area around the sinkhole is recommended for exclusion from the development.
- » It is recommended that a no-development buffer of 20m is implemented around these Grade IIIC structures.
- » Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.

- » Obtain the necessary permits for specimens or protected plant species that will be lost due to construction of the project.
- » As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.
- » A site walk through must be undertaken by a suitably qualified ecologist prior to any construction activities, preferably during the wet season and any SSC should be noted.
- » All other relevant permits should be obtained prior to construction of the proposed facility.

A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from the Department of Forestry, Fisheries and the Environment.

## CHAPTER 3 : PURPOSE AND OBJECTIVES OF THE EMPr

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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 Kiara PV2 Facility. The document must 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 4.1). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the Kiara PV2 Facility and/or as the project develops. This will ensure that the construction and operation activities are planned and implemented taking sensitive environmental features into account. 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). These, together with any additional mitigation and management measures included within the EIA for the project must be implemented throughout the project life-cycle.

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 the Kiara PV2 Facility.
- » 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.

The Developer 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. Since this EMPr is part of the EIA process for the Kiara PV2 Facility, 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.

## 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 project, an overarching 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**

<b>Project Component/s</b>	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> <li>» PV array and BESS</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	Brief description of potential environmental impact if objective is not met.
<b>Activity/Risk Source</b>	Description of activities which could affect achieving the objective.
<b>Mitigation: Target/Objective</b>	Description of the target and/or desired outcomes of mitigation.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
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

<b>Performance Indicator</b>	Description of key indicator(s) that track progress/indicate the effectiveness of the management programme.
<b>Monitoring</b>	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.

#### 4.1 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 Environmental Authorisation (EA) for the Kiara PV2 Facility. This EMPr has been prepared in accordance with DFFE's requirements as contained in Appendix 4 of the 2014 EIA Regulations (GNR 326), and within the Acceptance of Scoping dated 24 August 2022. 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 4.1.

**Table 4.1:** 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 –	Chapter 4 Appendix K
(i) The EAP who prepared the EMPr.	
(ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	
(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 2.2 to Figure 2.4 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.	Chapters 5 - 8
(ii) Comply with any prescribed environmental management standards or practices.	



Requirement	Location in this EMPr
(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.	
(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.	Chapter 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 4.2
(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

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

### 4.2.1 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 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

- » **Candy Mahlangu**, holds a Bachelor of Arts degree in Environmental Management and is experienced in executing professionally consulting services for various projects in the environmental management field. She specialises in conducting Environmental Impacts Assessments, public participation processes, compiling Environmental Management Programmes, for residential developments, commercial

developments, industrial upgrades, bulk services, and renewable energy projects. Her main responsibilities include conducting public participation, overall compilation of the Basic Assessments and EIA report, specialists' engagements, reviewing specialists reports and incorporating specialist studies into the Environmental Impact Assessment reports and the associated Environmental Management Programmes.

- » **Nkhensani Masondo**, the principle author of this report and EAP on this project is registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA (2020/1385) and holds a BSocSci in Environmental Analysis and Management and is currently completing her MSc in Environmental Management. She has six (6) years of working experience in the environmental field and has gained extensive experience in conducting Environmental Impact Assessments, Stakeholder Engagements, Environmental Auditing and Environmental Management Plans Programmes for a wide range of projects. She is responsible for overall compilation of the report, this includes reviewing specialists reports and incorporating specialist studies into the Basic Assessment report and its associated Environmental Management.
- » **Jo-Anne Thomas**, is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA - 2019/726). She provides technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Her key focus is on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures.

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 since 2006, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development. Curricula Vitae (CVs) detailing the Savannah Environmental team's expertise and relevant experience are provided in **Appendix K** of the EMPr.

#### 4.2.2 Details of the Specialist Consultants

A number of independent 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 (refer to **Table 4.1**). The specialist consultants have provided input into the EIA Report as well as this EMPr.

**Table 4.1: Specialist Consultants which form part of the EIA project team.**

Specialist	Area of Expertise
Lindi Steyn of The Biodiversity Company (Pty) Ltd and reviewed by Andrew Husted.	Ecology and Avifauna

Michael Douglas of The Biodiversity Company (Pty) Ltd and reviewed by Andrew Husted.	Agricultural Potential Assessment
Rian Pienaar of The Biodiversity Company (Pty) Ltd and reviewed by Andrew Husted.	Aquatic Ecology
Nondumiso Bulunga of Savannah Environmental and peer reviewed by Dr Neville Bews of Dr Neville Bews & Associates.	Social
Jenna Lavin of CTS Heritage	Heritage (including Archaeology Palaeontology and Cultural Landscape)

## 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 facility 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, power line), 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**

Subject to final Subject to final facility micro-siting and subsequent acceptance from DFFE, the development footprint detailed in Figure 2 must be implemented. Cognisance of sensitive areas defined in Figure 2 and within the EIA Report should be considered when undertaking the final design of the facility.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels</li> <li>» Access roads</li> <li>» Inverter stations</li> <li>» Transformer</li> <li>» Underground cabling</li> <li>» Associated buildings.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact on identified sensitive areas.</li> <li>» Design fails to respond optimally to the environmental considerations.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Positioning of all project components</li> <li>» Pre-construction activities, e.g. geotechnical investigations, site surveys and environmental walk-through surveys.</li> <li>» Positioning of temporary sites.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» The design of the PV facility, power line responds to the identified environmental constraints and opportunities.</li> <li>» Optimal planning of infrastructure to minimise visual impact.</li> <li>» Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer Contractor	Pre-construction
Consider all design related mitigation measures recommended within the EIA process.	Developer Contractor	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Developer Geotechnical specialist	Pre-construction
Pre-construction walk-through of the facility's final layout in order to locate species of conservation concern that can be translocated as well as comply with the LEDET/NWDEDECT permit conditions.	Developer/ Specialist	Pre-construction
Pre-construction walk-through of the facility's final layout in order to locate protected species that will be impacted as well as comply with the permit conditions.	Developer/ Specialist	Pre-construction
Search and rescue for identified species of concern before construction.	Developer/ Specialist	Pre-construction
Finalise layout of all components, and submit to DFFE for approval prior to commencement of construction.	Developer	Prior to construction
The EMPr should form part of the contract with the Contractors appointed to construct the PV facility and associated infrastructure,, and must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.	Developer Contractor	Tender Design and Design Review Stage
Plan the placement of laydown areas and assembly plant in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible and to avoid habitat loss and disturbance to adjoining areas.	Developer	Pre-construction
The construction equipment camps must be planned as close to the site as possible to minimise impacts on the environment.	Developer	Pre-construction
Ensure that laydown areas and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible.	Developer	Project planning
A 50m no-go development buffer must be implemented around sites WP007, WP008 and WP009	Developer	Project planning
A 32 m Zone of Regulation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) should be assigned to the drainage lines and a 100 m ZoR in accordance with the National Water Act, 1998 (Act No. 36 of 1998) should be assigned to the drainage lines.	Developer	Project planning
Plan development levels to minimise earthworks to ensure that levels are not elevated.	Developer	Project planning
Plan to apply bird deterrent devices 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	Developer Contractor	Planning & Design

Mitigation: Action/Control	Responsibility	Timeframe
chasing activities involving the use of trained dogs or raptors and/or netting.		
The construction site must be fenced off. The fence around the facility should be designed to be animal and bird friendly, to prevent entrapment and electrocutions of ground-dwelling birds and animals. In practical terms this means that the perimeter fence of the facility should only include the developed areas and as little undeveloped ground or natural veld as possible. No electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.	Developer	Project planning
Clear rules and regulations for access to the proposed site must be developed.	Developer Contractor	Pre-Construction
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.	Developer	Planning and 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
New elements should be designed to blend as naturally as possible with their backdrop.	Developer Design engineer	Design and planning
Plan to maintain the height of structures as low as possible.	Developer Design engineer	Design and planning
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development	Developer Design engineer	Design and planning
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer Contractor	Pre-construction
Consider planning and design level mitigation measures recommended by the specialists as part of the EIA process.	Engineering Consultant	Design Phase
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further than that proposed for the project. Clearing of vegetation should be minimized and avoided where possible.	Developer Contractor	Pre-construction
Where possible, existing access routes and walking paths must be made use of.	Developer Contractor	Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» The design meets the objectives and does not degrade the environment.</li> <li>» Demarcated sensitive areas are avoided at all times.</li> <li>» Design and layouts respond to the mitigation measures and recommendations in the EIA Report.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.</li> <li>» Monitor ongoing compliance with the FMP and method statements.</li> </ul>

**OBJECTIVE 2: Ensure that relevant permits and plans are in place to manage impacts on the environment**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV Array and BESS</li> <li>» Access roads</li> <li>» Inverter stations</li> <li>» Transformer</li> <li>» Underground cabling</li> <li>» Associated buildings.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact on identified sensitive areas and protected species.</li> <li>» Design fails to respond optimally to the environmental considerations.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Positioning of all project components</li> <li>» Pre-construction activities, e.g. geotechnical investigations, site surveys and internal access roads and environmental walk-through surveys.</li> <li>» Positioning of temporary sites.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the design of the power plant responds to the identified environmental constraints and opportunities.</li> <li>» To ensure that pre-construction activities are undertaken in an environmentally friendly manner.</li> <li>» To ensure that the design of the power plant responds to the identified constraints identified through pre-construction surveys.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Obtain abnormal load permits for transportation of project components to site (if required).	Contractor(s)	Pre-construction
Permits from the relevant provincial authorities, will be required to relocate and/or disturb listed plant species.	Developer	Pre-construction
A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found.	Developer Contractor	Pre-construction
Prepare a detailed Fire Management Plan (FMP) in collaboration with surrounding landowners.	Developer	Pre-construction
Communicate the FMP to surrounding landowners and maintain records thereof.	Developer	Pre-construction Construction
A Stormwater Management Plan (SWMP) should be developed and should provide for a drainage system sufficiently designed to prevent water run-off from the solar panels to cause soil erosion.	Developer Design engineer	Pre-construction
Compile a procedure for the safe handling of battery cells during transportation and installation	Developer Design engineer	Pre-construction
Develop and implement an alien, invasives and weeds eradication/control plan	Developer Specialist	Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Permits are obtained and relevant conditions complied with.</li> <li>» Impact on protected plant species reduced to some degree through Search and Rescue.</li> </ul>
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	» Relevant management plans and Method Statements prepared and implemented.
<b>Monitoring</b>	» 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 EMP and method statements.

**OBJECTIVE 3: Ensure appropriate planning is undertaken by contractors**

<b>Project Component/s</b>	» PV panels » Access roads » Inverter stations » Transformer » BESS » Underground cabling » Associated buildings.
<b>Potential Impact</b>	» Impact on identified sensitive areas. » Design and planning fail to respond optimally to the environmental considerations.
<b>Activities/Risk Sources</b>	» Positioning of all project components » Pre-construction activities. » Positioning of temporary sites. » Employment and procurement procedures.
<b>Mitigation: Target/Objective</b>	» To ensure that the design of the PV facility responds to the identified environmental constraints and opportunities. » To ensure that pre-construction activities are undertaken in an environmentally friendly manner.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Developer Contractor	Pre-construction
Create awareness of skills through posters and media announcements and set-up a skills desk at a central and accessible location. The skills desk should serve to record local job seeker skills.	Developer Contractor	Pre-construction
The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers were feasible.	Developer Contractor	Pre-construction

<b>Performance Indicator</b>	» Conditions of the EMPr form part of all contracts. » Local employment and procurement is encouraged.
<b>Monitoring</b>	» Monitor ongoing compliance with the EMP and method statements.



**OBJECTIVE 4: 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.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Access road.</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	» Impacts on affected and surrounding landowners and land uses
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Activities associated with construction</li> <li>» Activities associated with operation</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Effective communication with affected and surrounding landowners, and communities.</li> <li>» Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Compile and implement a grievance mechanism procedure for the public 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)
Liaising 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
Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for	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
Clearly inform the local municipality of the potential impact of the proposed project in order for the necessary preparations to take place	Developer	Pre-construction

<b>Performance Indicator</b>	» Effective communication procedures in place.
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**Monitoring**

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

## CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION

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

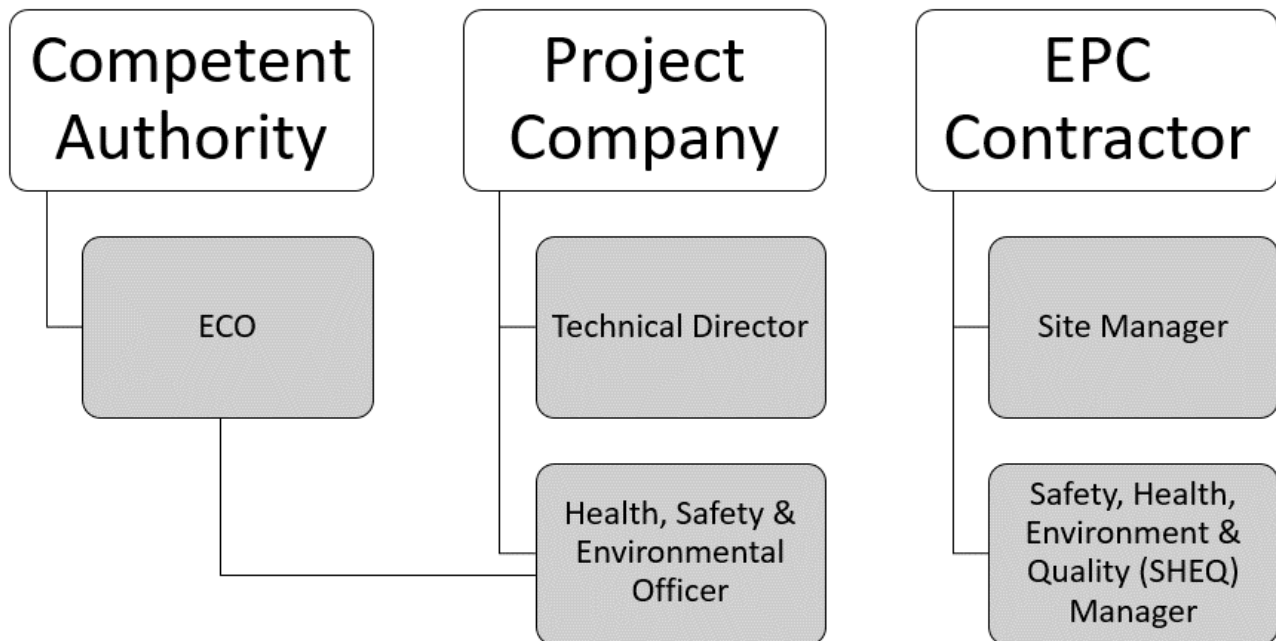
- » Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
- » Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, 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, Main Street 1886 Proprietary Limited 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 Contractor's 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 of the contents of the EIA.
- » Be fully knowledgeable of the contents of the conditions of the EA (once issued).
- » Be fully knowledgeable of the contents of the EMPr.
- » Be fully knowledgeable of the contents of all relevant environmental legislation, and ensure compliance therewith.
- » Be fully knowledgeable with the contents of all relevant licences and permits issued for the project.
- » Ensure that the contents of the EMPr are communicated to the Contractors site staff and that the Site Manager and Contractors are constantly made aware of the contents through ongoing discussion.
- » Ensure that compliance with the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Independently report to the Department of Forestry, Fisheries and the Environment (DFFE) in terms of compliance with the specifications of the EMPr and conditions of the EA (once issued).
- » Keep records of all reports submitted to DFFE.

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter, weekly site compliance inspections would probably be sufficient, which must be increased if required. The ECO will be supplemented with the EPC Contractor's/Project Company's Environmental Office (EO) who will be located on site on a daily basis and will guide the EPC Contractor's/Project Company's to ensure compliance with the environmental considerations. Therefore, in the absence of the ECO there will 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.

**Contractor's Safety, Health and Environment Representative and/or Environmental Officer:** The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and

related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor. In some instances, a separate Environmental Officer (EO) may be appointed to support this function.

The Contractor's Safety, Health and Environment Representative and/or Environmental Officer should:

- » Be well versed in environmental matters.
- » Understand the relevant environmental legislation and processes and the implementation thereof.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- » Know the background of the project and understand the implementation programme.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this specification.
- » Keep accurate and detailed records of all EMPr-related activities on site. The EO shall keep a daily diary for monitoring the site specific activities as per project schedule.
- » 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) and therefore needs the relevant training/ experience. The EO will have overall responsibility for day-to day environmental management and implementation of mitigations.
- » The EO is responsible for reporting to the ECO on the day-to-day on-site implementation of this EMPr and other Project Permits/Authorisations.
- » Ensure or otherwise train and induct all contractor's employees prior to commencement of any works.
- » Ensure that there is daily communication with the Site Manager regarding the monitoring of the site.
- » Compilation of Weekly and Monthly Monitoring Reports to be submitted to the ECO and Site Manager.
- » In addition, the EO/ Environmental Representative must act as project liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager, ECO and Contractor(s).

**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 must 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).

**Community Liaison Officer (CLO)** will represent the community and assist the Owner, Contractor and the Engineer with communication between them and the community. Inform community regarding the project details, safety precautions and programme. Duties and responsibilities of the community liaison officer include:

- » Be available at the site offices generally between the hours of 07:00 and 09:00 and again from 15:00 until end of working day. Normal working hours will be from 07:00 am till 17:00.
- » Maintain an up-to-date record of potential employees within the community and provide the contractor with copies of this information.
- » To identify, screen and nominate labour from the community in accordance with the Contractor's requirements and determine, in consultation with the Contractor, the needs of local labour for employment and relevant technical training, where applicable.
- » Liaise between Contractor and labour regarding wages and conditions of employment.
- » Communicate daily with the Contractor on labour related issues such as numbers and skills.
- » Identify possible labour disputes, unrest, strikes, etc., in advance and assist in their resolution.
- » Have a good working knowledge of the contents of the contract document regarding labour and training matters.
- » Attend all meetings at which the community and/or labour is represented or discussed.
- » Attend contract site meetings and report on community and labour issues at these meetings.
- » Co-ordinate and assist with the obtaining of information regarding the community's needs (questionnaires, etc.).
- » Inform local labour of their conditions of temporary employment, to ensure their timeous availability and to inform them timeously of when they will be relieved.
- » Ensure that all labour involved in activities when tasks have been set, are fully informed of the principle of task-based work.



- » Attend disciplinary proceedings to ensure that hearings are fair and reasonable.
- » Keep a daily written record of interviews and community liaison.
- » Arrange venues for training if required.
- » Assist with the training and education of the community regarding the correct usage of the services, where applicable.
- » Any other duties that may become necessary as the works progress.

## 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**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Area infrastructure (i.e. PV panels,, inverters, transformers, switchgear and ancillary buildings).</li> <li>» Linear infrastructure (i.e. underground cabling, main access road and internal access roads and fencing).</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Hazards to landowners and the public.</li> <li>» Damage to indigenous natural vegetation.</li> <li>» Loss of threatened plant species.</li> <li>» Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Any unintended or intended open excavations (foundations and cable trenches).</li> <li>» Movement of construction vehicles in the area and on-site.</li> <li>» Transport to and from the temporary construction area/s.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To secure the site against unauthorised entry.</li> <li>» To protect members of the public/landowners/residents.</li> <li>» No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.</li> <li>» Minimal visual intrusion by construction activities and intact vegetation cover outside of the immediate construction work areas.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Secure site, working areas and excavations in an appropriate manner.	Contractor	Site establishment, and duration of construction
Ensure that no activities infringe on identified no-go and high sensitivity areas.	Contractor	Duration of construction
The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified in the EIA Report.	Contractor	Duration of construction
Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.	Contractor	Site establishment, and duration of construction
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	Developer Contractor	Pre-construction Construction



Mitigation: Action/Control	Responsibility	Timeframe
Contractor's Environmental Officer (EO) must provide supervision and oversight of vegetation clearing activities within sensitive areas.	Contractor EO	Construction
Any individuals of protected species affected by and observed within the development footprint during construction should be translocated under the supervision of the Contractor's SHE or EO.	SHE/EO Specialist	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 to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
The construction site must be fenced and security provided.	Contractor	Construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes.	Contractor	Construction
All unattended open excavations must be adequately demarcated and/or fenced.	Contractor	Construction
Establish appropriately bunded areas for storage of hazardous materials (e.g. fuel to be required during construction).	Contractor	Site establishment, and duration of construction
Visual impacts must be reduced during construction through minimising areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soil as closely as possible to their original contour and vegetation.	Contractor	Site establishment, and duration of construction
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but must be temporarily stored in a demarcated area.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers so that the surrounding environment is not polluted (at least one sanitary facility for each sex and for every 30 workers as per the 2014 Construction Regulations; Section 30(1) (b)) at appropriate locations on site). The facilities must be placed within the construction area and along the road.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities must not be located within 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
Construct stormwater drains or bunds to divert clean runoff around dirty areas. The diversion should be sized for 1 in 5-year event. Typical design will be an excavated earth channel or berms.	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
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

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Site is secure and there is no unauthorised entry.</li> <li>» No members of the public/ landowners injured.</li> <li>» Appropriate and adequate waste management and sanitation facilities provided at construction site.</li> <li>» 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.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» An incident reporting system is used to record non-conformances to the EMPr.</li> <li>» EO and 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.</li> <li>» Monitoring of vegetation clearing during construction (by contractor as part of construction contract).</li> <li>» Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).</li> </ul>

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

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Area infrastructure (i.e. PV panels, BESS, inverters, transformers, switchgear and ancillary buildings).</li> <li>» Linear infrastructure (i.e. underground cabling, main access road and internal access roads and fencing).</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Damage to indigenous natural vegetation and sensitive areas.</li> <li>» Damage to and/or loss of topsoil (i.e. pollution, compaction etc.).</li> <li>» Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities.</li> <li>» Pollution/contamination of the environment.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Vegetation clearing and levelling of equipment storage area/s.</li> <li>» Access to and from the equipment storage area/s.</li> <li>» Ablution facilities.</li> <li>» Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Limit equipment storage within demarcated designated areas.</li> <li>» Ensure adequate sanitation facilities and waste management practices.</li> <li>» Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Restrict public access to works area including construction areas, laydown and storage sites via appropriate security. Only allow site access after appropriate induction and use of appropriate personal protective equipment	Contractors	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Contractors and construction workers must be clearly informed of the no-go, very high and high sensitivity areas.	Developer Contractor	Prior to the commencement of construction
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.	Contractors	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.	Contractor and sub-contractor/s	Pre-construction
Introduce an incident reporting system to be tabled at weekly/monthly project meetings.	Contractor and sub-contractor/s	Pre-construction
All construction vehicles must adhere to clearly defined and demarcated roads. No driving outside of the development boundary must be permitted.	Contractor	Construction
Ensure all construction equipment and vehicles are properly maintained at all times.	Contractor	Construction
Avoid parking of vehicles and equipment outside of designated parking areas.	Contractor	Site establishment, and during construction
Restrict work activities that require power tools and plant that generates noise to normal working hours and limit such activities over weekends.	Contractor	Construction
Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.	Contractor	Construction
Appoint a community liaison officer to deal with complaints and grievances from the public.	Contractor	Construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community and/or environment.	Contractor	Construction
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Personnel trained in first aid should be on site to deal with smaller incidents that require medical attention.	Contractor	Construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan must be developed with emergency procedures in the event of a fire.	Contractor	Site establishment, and during construction

Mitigation: Action/Control	Responsibility	Timeframe
Encourage contractors and local people to report any suspicious activity associated with crime to the appropriate authorities.	Contractor	Construction
Ensure that the local municipalities, police, security companies, and policing forums are alerted to the increased construction activities in the region and the risk it poses in respect of crime.	Contractor	Duration of Contract
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
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 watercourses and drainage systems (especially those located within and surrounding the project site) and the significance of not undertaking activities that could result in such pollution.	Contractor and EO	Pre-construction 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

Mitigation: Action/Control	Responsibility	Timeframe
When possible, no activity should be undertaken at the site between sunset and sunrise, except for security personnel guarding the development.	Contractor and sub-contractor/s	Construction
Keep record of all accidents or transgressions of safety in accordance with OHS Act and implement corrective action.	Contractor	Construction
Implement an HIV/AIDS Awareness and Training Programme for the Contractor's workforce and if feasible the local community within two weeks of commencement of construction. Ensure that the HIV/AIDS Awareness and Training Programme is consistent with national guidelines and/or IFC's Good Practice.	Contractor	Construction
Provide voluntary and free counselling, free testing and condom distribution services.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» The construction camps and laydown areas have avoided sensitive areas.</li> <li>» Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement.</li> <li>» All areas are rehabilitated promptly after construction in an area is complete.</li> <li>» Excess vegetation clearing and levelling is not undertaken.</li> <li>» No complaints regarding contractor behaviour or habits.</li> <li>» Appropriate training of all staff is undertaken prior to them commencing work on the construction site.</li> <li>» Code of Conduct drafted before commencement of the construction phase.</li> <li>» Compliance with OHS Act.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular audits of the construction camps and areas of construction on site by the EO.</li> <li>» Proof of disposal of sewage at an appropriate licensed wastewater treatment works.</li> <li>» Proof of disposal of waste at an appropriate licensed waste disposal facility.</li> <li>» An incident reporting system should be used to record non-conformances to the EMPr.</li> <li>» Observation and supervision of Contractor practices throughout the construction phase by the EO.</li> <li>» Complaints are investigated and, if appropriate, acted upon.</li> <li>» Comprehensive record of accidents and incidence and related investigations, findings and corrective action in accordance with the OHS Act.</li> </ul>

**OBJECTIVE 4: Maximise local employment, skills development and business opportunities associated with the construction phase**

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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Construction activities associated with the establishment of the PV facility.</li> <li>» Availability of required skills in the local communities for the undertaking of the construction activities.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» The opportunities and benefits associated with the creation of local employment and business should be maximised.</li> </ul>

<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals.</li> <li>» Sourcing of individuals with skills similar to the local labour pool outside the municipal area.</li> <li>» Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area.</li> <li>» Higher skilled positions might be sourced internationally, where required.</li> </ul>
<b>Enhancement: Target/Objective</b>	<ul style="list-style-type: none"> <li>» The contractor 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.</li> <li>» Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible.</li> <li>» Appropriate skills training and capacity building.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities. Ensure that the majority of the low-skilled workforce is recruited locally.	Contractor	Construction
Undertake a skills audit to determine level of skills and establish the development and training requirements.	Contractor	Construction
Commence with skill development programmes within the first month of construction	Contractor	Construction
Identify employment opportunities for women and ensure that women are employed on the construction site and are trained.	Contractor	Construction
Facilitate the transfer of knowledge between experienced employees and the staff.	Contractor	Construction
Identify opportunities for local businesses and ensure that the services from local businesses are prioritised.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Composition of labour force and value of procurement from local businesses.</li> <li>» Level of skills imparted to local workforce.</li> </ul>
<b>Monitoring</b>	» Human Resources and Finance function to monitor and report on through audits.

### **OBJECTIVE 5: Protection of sensitive areas, flora, fauna and soils**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Underground cabling.</li> <li>» Ancillary buildings.</li> <li>» Construction of the internal access roads.</li> <li>» BESS.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impacts on natural vegetation, habitats and fauna (including avifauna).</li> <li>» Loss of indigenous natural vegetation due to construction activities.</li> <li>» Impacts on soil.</li> <li>» Loss of topsoil.</li> <li>» Erosion.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Vegetation clearing.</li> <li>» Site preparation and earthworks.</li> </ul>

	<ul style="list-style-type: none"> <li>» Excavation of foundations.</li> <li>» Construction of infrastructure.</li> <li>» Site preparation (e.g. compaction).</li> <li>» Excavation of foundations.</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise the development area as far as possible.</li> <li>» To minimise impacts on surrounding sensitive areas.</li> <li>» To minimise impacts on soils.</li> <li>» Minimise spoil material.</li> <li>» Minimise erosion potential.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited to the minimum necessary to accommodate the required infrastructure.	Contractor	Duration of contract
Any individuals of protected species affected by and observed within the development footprint during construction should be translocated under the supervision of the Contractor's Environmental Officer (EO).	Contractor EO	Construction
Land clearance must only be undertaken immediately prior to construction activities.	Contractor	Construction
Ensure that laydown areas, construction camps and other temporary use areas are located in areas of low and medium sensitivity and are properly fenced or demarcated as appropriate and practically possible.	Contractor	Construction
All laydown, chemical toilets etc. should be restricted to very low/low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Contractor	Construction
Retain and augment natural vegetation on all sides of the proposed project.	Contractor	Construction
During vegetation clearance, methods should be employed to minimise potential harm to fauna species.	Contractor	Construction
Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery.	Contractor	Construction
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. Restrict construction activity to demarcated areas.	Contractor	Duration of 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. Where possible work should be restricted to one area at a time.	Contractor	Construction
Access to adjacent areas to be strictly controlled.	Developer Contractor	Pre-construction Construction



Mitigation: Action/Control	Responsibility	Timeframe
No harvesting of plants for firewood, medicinal or any other purposes are to be permitted	Contractor	Construction
No killing and poaching of any wild animal to be allowed. This should be clearly communicated to all employees, including subcontractors.	Contractor	Construction
Enforce ban on hunting, collecting etc. of all plants and animals or their products.	Contractor EO	Construction
Areas beyond the development footprint should be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.	Contractor	Construction
If trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	Contractor	Construction
Any fauna threatened or injured during construction should be removed to safety by a suitably qualified person, or allowed to passively vacate the area.	Suitably qualified person	Construction
Education of employees on the conservation importance of natural areas and fauna must be provided.	Contractor	Construction
Access to high sensitivity and no-go areas to be restricted and controlled. This should be clearly communicated to all employees.	Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads	Contractor	Construction
All construction vehicles should adhere to a low speed limit (30km/h for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction
If the facility is to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.	Contractor	Construction
No collecting of flora species to be permitted.	Contractor	Construction
Topsoil must be removed and stored separately from subsoil 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.	Contractor	Construction
Soil stockpiles must not exceed 2 m in height.	Contractor	Construction
Soil stockpiles must be dampened with dust suppressant or equivalent to prevent erosion by wind.	Contractor	Construction
Soil stockpiles must be located away from any waterway or preferential water flow path in the landscape, to minimise soil erosion from these	Contractor	Construction



Mitigation: Action/Control	Responsibility	Timeframe
All graded or disturbed areas which will not be covered by permanent infrastructure such as paving, buildings or roads must be stabilised using appropriate erosion control measures.	Contractor	Construction
A method statement must be developed and submitted to the engineer to deal with erosion issues prior to bulk earthworks operations commencing.	Contractor	Before and during construction
Stockpiles are not to be used as stormwater control features.	Contractor	Construction
Any stockpiling of materials may not exceed two metres in height to reduce materials being blown away during high wind velocity events.	Contractor	Construction
Any erosion problems within the development area as a result of the construction activities observed must be rectified immediately and monitored thereafter to ensure that they do not re-occur.	Contractor	Construction
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 for further action.	Contractor	Construction
During construction the contractor shall protect areas susceptible to erosion by installing appropriate 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.	Contractor	construction
Create energy dissipation at discharge areas to prevent scouring	Contractor	construction
Activity at the site must be reduced after large rainfall events when the soils are wet. No driving off of hardened roads should occur at any time and particularly immediately following large rainfall events.	Contractor	Construction
Silt traps or cut-off berms downslope of working areas should be used where there is a danger of topsoil or material stockpiles eroding and entering watercourses and other sensitive areas.	Contractor	Construction
Erosion control measures to be regularly maintained.	Contractor	Construction
If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place.	Contractor	Construction
If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Compacted areas are to be ripped to loosen the soil structure.	Contractor	Construction
The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks.	Contractor	Construction
Topsoil is to be stripped when the soil is dry, as to reduce compaction.	Contractor	Construction
The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly	Contractor	Construction
Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Compacted areas are to be ripped to loosen the soil structure.	Contractor	Construction
Place the above cleared vegetation where the topsoil stockpiles are to be placed.	Contractor	Construction
All construction vehicles must adhere to a low speed limit (40km/h) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction Operation
Outside lighting should be designed to minimise impacts on fauna.	Contractor	Before construction
All night-lighting should use low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution.	Contractor	Construction
Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible.	Contractor	Construction
In order to reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered.  Noise from vehicles and powered machinery and equipment on-site should not exceed the manufacturer's specifications, based on the installation of a silencer. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No disturbance outside of designated work areas.</li> <li>» Minimised clearing of existing vegetation.</li> <li>» Vegetation and habitat loss restricted to infrastructure footprint.</li> <li>» No poaching etc of fauna by construction personnel during construction.</li> <li>» Removal to safety of fauna encountered during construction</li> <li>» Low mortality of fauna due to construction machinery and activities</li> <li>» Topsoil appropriately stored, managed and rehabilitated.</li> <li>» Limited soil erosion around site.</li> <li>» No activity in restricted areas.</li> <li>» Minimal level of soil degradation.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Contractor's Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the pan.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» Ongoing monitoring of erosion management measures within the site.</li> <li>» Monthly inspections of sediment control devices by the EO.</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr.</li> </ul>

**OBJECTIVE 6: Minimise impacts to avifauna**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Any infrastructure or activity that will result in disturbance to natural areas</li> <li>» PV Panels</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Vegetation clearance and associated impacts on faunal habitats.</li> <li>» Traffic to and from site.</li> <li>» Loss of avifauna due to interactions with humans and site infrastructure</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Construction-related traffic.</li> <li>» Foundations or plant equipment installation.</li> <li>» Mobile construction equipment.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise footprints of habitat destruction</li> <li>» To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Bird deterrent devices must be applied 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. Nests should be removed when nest-building attempts are noticed.	Contractor	Construction
Killing or poaching of any bird species should be avoided by means of awareness programs presented to the labour force. The labour force should be made aware of the conservation issues pertaining to the bird taxa occurring on the study site. Any person found deliberately harassing any bird species in any way should face disciplinary measures, following the possible dismissal from the site.	Contractor	Construction
All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species (e.g., guineafowl and francolin), and owls, which are often persecuted out of superstition. Signs must be put up to enforce this.	Contractor / ECO	Construction
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapour (red/green) lights should be used wherever possible.	Contractor	Construction
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
speed limit (40 km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.		
White strips should be placed along the edges of the panels, to reduce similarity to water and deter birds and insects (Horvath et al, 2010). Consider the use of bird deterrent devices to limit collision risk.	Contractor	Construction
The BESS must be enclosed, and the outside surface must be non-reflective to ensure fire is not a risk and that bird collisions does not take place.	Contractor	Construction
The design of the proposed PV and must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2015).	Design Engineer	Construction
Any exposed parts must be covered (insulated) to reduce electrocution risk.	Contractor	Construction
As far as possible power cables within the project site should be thoroughly insulated and preferably buried.	Contractor	Construction
Fencing mitigations: <ul style="list-style-type: none"> <li>• Top 2 strands must be smooth wire</li> <li>• Routinely retention loose wires</li> <li>• Minimum 30 cm between wires</li> <li>• Place markers on fences</li> </ul>	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Zero disturbance outside of designated work areas</li> <li>» Minimised clearing of existing/natural vegetation and habitats for avifauna</li> <li>» Limited impacts on avifaunal species (i.e. noted/recorded fatalities)</li> <li>» Identification of avifauna carcasses.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Avifaunal monitoring to detect movement through the development footprint.</li> <li>» Construction phase avifauna monitoring to record movement and abundance through the development footprint.</li> </ul>

### **OBJECTIVE 7: 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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Access road.</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.</li> <li>» Impacts on soil.</li> <li>» Impact on faunal habitats.</li> <li>» Degradation and loss of agricultural potential.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Transport of construction materials to site.</li> <li>» Movement of construction machinery and personnel.</li> <li>» Site preparation and earthworks causing disturbance to indigenous vegetation.</li> <li>» Construction of site access roads.</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> <li>» Routine maintenance work – especially vehicle movement.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To significantly reduce the presence of weeds and eradicate alien invasive species.</li> <li>» To avoid the introduction of additional alien invasive plants to the site.</li> <li>» To avoid distribution and thickening of existing alien plants in the site.</li> <li>» To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the site.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Develop and implement an IAP Control and Eradication Programme.	Contractor	Construction
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> <li>» Keep disturbance of indigenous vegetation to a minimum.</li> <li>» Rehabilitate disturbed areas as quickly as possible.</li> <li>» Do not import soil from areas with alien plants.</li> </ul>	Contractor	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
An invasive Bluegum ( <i>Eucalyptus camaldulensis</i> ) occurs in the north east of the study area.	Contractor	Contractor
All alien plant re-growth must be monitored and should it occur these plants should be eradicated	Contractor	Construction
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species	Contractor	Construction
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
used on site along with any other nationally or internationally similarly restricted/banned products.		

<b>Performance Indicator</b>	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» On-going monitoring of area by EO during construction.</li> <li>» Annual audit of development footprint and immediate surroundings by qualified botanist.</li> <li>» 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.</li> <li>» The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site.</li> <li>» The environmental manager/site agent should be responsible for driving this process.</li> <li>» Reporting frequency depends on legal compliance framework.</li> </ul>

**OBJECTIVE 8: 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.

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

Mitigation: Action/Control	Responsibility	Timeframe
Stormwater from hard stand areas, and roads must be managed using appropriate channels and swales when located within steep areas.	Contractor	Construction
Engineer low velocity temporary drains: Drains sloped and sized such that velocities do not exceed 1 m/s in a 1 in 5-year event	Contractor	Construction
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities	Contractor	Construction
Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving the Solar PV site.	Contractor and Engineers	Construction
Stormwater control systems must be implemented to reduce erosion on the project site.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Silt traps must be used where there is a danger of topsoil eroding and entering streams and other sensitive areas.	Contractor	Construction
<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No impacts due to runoff.</li> <li>» Minimise erosion as far as possible.</li> <li>» Appropriate storm water management system in place.</li> </ul>	
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ongoing monitoring of erosion management measures within the site.</li> <li>» Monthly inspections of sediment control devices by the EO.</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr.</li> </ul>	

### OBJECTIVE 9: Protection of heritage resources

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Access roads.</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	» Heritage objects or artefacts found on site are inappropriately managed or destroyed.
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Foundations or plant equipment installation.</li> <li>» Mobile construction equipment movement on site.</li> </ul>
<b>Mitigation: Target/Objective</b>	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

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
Environmental Officer (EO) to alert workers to the importance of reporting fossil bones seen on site and to the possibility of encountering human remains.	EO	Construction
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	Contractor	Construction
A chance find procedure must be implemented in the event that archaeological or palaeontological resources are found.	Contractor Heritage specialist	Construction
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	Heritage Specialist	Pre-construction
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 material that may contain fossils. Inform the site foreman and the EO. EO to inform the Developer; the Developer contacts the standby	Contractor and EO	Construction



Mitigation: Action/control	Responsibility	Timeframe
archaeologist and/or palaeontologist. EO to describe the occurrence and provide images by email.		
Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.	Contractor and EO	Construction
Should any previously unrecorded palaeontological resources be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.	Contractor and EO	Construction
Ruin and Kraal fall within sensitive areas and 20m no-go Buffer must be implemented.	Contractor Heritage specialist	Construction
Stromatolitic dolomite of the Monte Christo Formation in a well-defined sinkhole depression in the study area. The unique setting of this micro-ecosystem warrants exclusion of the site from development. Area around the sinkhole is recommended for exclusion from the development.	Contractor Heritage specialist	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No disturbance outside of designated work areas.</li> <li>» All heritage items located are dealt with as per the legislative guidelines.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of excavation activities by the EO throughout construction phase.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported.</li> <li>» Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites (if required).</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr.</li> </ul>

### **OBJECTIVE 10: Minimisation of visual impacts associated with construction**

During construction heavy vehicles, components, cranes, equipment and construction crews will frequent the area and may cause, at the very least, a visual nuisance to landowners and residents in the area as well as road users.

<b>Project component/s</b>	» Construction site and activities
<b>Potential Impact</b>	» Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and the resulting erosion.
<b>Activity/risk source</b>	» The viewing of visual scarring by observers on or near site.
<b>Mitigation: Target/Objective</b>	» Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate construction work areas.



Mitigation: Action/control	Responsibility	Timeframe
Ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during the construction phase, where possible.	Contractor	Construction
Reduce the construction phase through careful logistical planning and productive implementation of resources wherever possible.	Contractor	Construction
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Contractor	Construction
Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.	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
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works.	Contractor	Construction
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting, where possible.	Contractor	Construction

<b>Performance Indicator</b>	» Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation present within the environment) with no evidence of degradation or erosion.
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Monitoring of vegetation clearing during construction (by contractor as part of construction contract).</li> <li>» Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).</li> </ul>

### **OBJECTIVE 11: Management of dust and emissions to air**

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 main and internal access roads.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Access roads.</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Dust generation and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility.</li> <li>» Release of minor amounts of air pollutants (for example NO<sub>2</sub>, CO and SO<sub>2</sub>) from vehicles and construction equipment.</li> </ul>

<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Clearing of vegetation and topsoil.</li> <li>» Excavation, grading, scraping, levelling, digging, drilling and associated construction activities.</li> <li>» Transport of materials, equipment, and components on internal access roads and the associated increased traffic.</li> <li>» Vehicle movement on gravel roads.</li> <li>» Re-entrainment of deposited dust by vehicle movements.</li> <li>» Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces.</li> <li>» Fuel burning vehicle and construction engines.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase.</li> <li>» To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase.</li> <li>» Suppression of dust, pollution control and minimise dust generation.</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Implement appropriate dust suppression measures on a regular basis along the access road and on the proposed site.	Contractor	Construction
Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Construction
Areas to be cleared in a progressive manner. Road surfaces and other infrastructure to be constructed as soon as possible after vegetation clearing in order to minimise exposed ground surfaces, specifically roads which carry traffic.	Contractor	Construction
Roads must be maintained to a manner that will ensure that nuisance to the community from dust emissions from road or vehicle sources is not visibly excessive.	Contractor	Construction
Appropriate dust suppressant must be applied on all gravel roads associated, exposed areas and stockpiles associated to the project as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered with suitable material tarpaulins shade cloth.	Contractor	Duration of contract
Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Contractor	Duration of contract
Speed of construction vehicles must be restricted to 40km/hr on all roads within the site.	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
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
All vehicles and containers used for moving waste must encapsulate the waste, which prevents the waste from causing	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
odours and from escaping or blowing around the site. This will also prevent leachate material from spilling out of the containers, which is hazardous.		
Should a batching plant be required, this must be enclosed with shade cloth to reduce the amount of cement particulates/particles released into the environment.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints from affected residents or community regarding dust or vehicle emissions.</li> <li>» Visual presence of dust and air quality.</li> <li>» Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility).</li> <li>» Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> <li>» All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation.</li> <li>» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.</li> <li>» 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.</li> </ul>
<b>Monitoring</b>	<p>Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager.</li> <li>» 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.</li> <li>» An incident register and non-conformance must be used to record incidents and non-conformances to the EMPr.</li> <li>» A complaints register must be used to record grievances by the public.</li> </ul>

**OBJECTIVE 12: Minimise impacts related to traffic management and transportation of equipment and materials to site**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Delivery of any component required for the construction phase of the facility.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals.</li> <li>» Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted.</li> <li>» Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Construction vehicle movement.</li> <li>» Speeding on local roads.</li> <li>» Degradation of local road conditions.</li> <li>» Site preparation and earthworks.</li> </ul>

	<ul style="list-style-type: none"> <li>» Foundations or plant equipment installation.</li> <li>» Transportation of ready-mix concrete to the site.</li> <li>» Mobile construction equipment movement on-site.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimise impact of traffic associated with the construction of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users.</li> <li>» To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction.</li> <li>» To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Adequate traffic accommodation signage must be erected and maintained on either side of the access, on the trafficked routes, throughout the construction period	Contractor	Pre-construction
Undertake regular maintenance of gravel roads by the Contractor during the construction phase.	Contractor	Construction
Implement penalties for reckless driving as a way to enforce compliance to traffic rules.	Contractor	Construction
The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged (i.e. wear and tear) due to construction activities.	Developer Contractor	Construction
Should abnormal loads have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government. Alert traffic authorities well in advance of any heavy loads that will be transported on local roads and elicit their assistance in controlling traffic associated with the transportation of these loads.	Contractor appointed transportation contractor)	(or Pre-construction
Ensure that, at all times, people have access to their properties as well as to social facilities.	Developer Contractor	Construction
Limit the need for transportation over long distances by sourcing as much materials and goods as is feasible from local suppliers.	Contractor	Construction
Heavy vehicles used for construction purposes should be inspected regularly to ensure their road-worthiness.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor	Construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Construction
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 appointed transportation contractor)	(or Construction
Heavy construction vehicles should be restricted to off-peak periods. Schedule the delivery hours to avoid peak hour traffic, weekends and evenings and stagger component delivery to site.	Contractor	Construction
Staff and general trips to the site should occur outside of peak traffic periods.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Any traffic delays expected because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Construction
When upgrading, constructing and maintaining the access road ensure that proper hazard warnings signage and traffic control mechanisms such as flags men and traffic control barriers, chevrons and traffic cones separating the road from the worksite are in place at all times	Contractor	Construction
Visible signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards). Signage must be appropriately maintained throughout the construction period.	Contractor	Construction
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	Construction
All construction vehicles must remain on properly demarcated roads. No off-road driving to be allowed.	Contractor	Construction
The contractors must ensure that there is a dedicated access and an access control point to the site.	Contractor	Construction
Provide clearly defined roadway, parking and pedestrian walkway areas within the site with adequate lighting	Contractor	Construction
Partner with local municipalities and other prominent users of the local roads to upgrade them to meet the required capacity and intensity of the vehicles related to the planned construction activities.	Contractor	Construction
Provide public transportation service for workers in order to reduce congestion on roads.	Contractor	Construction
All construction vehicles must be road worthy.	Contractor	Construction
All construction vehicle drivers must have the relevant licenses of the use of the vehicles and need to strictly adhere to the rules of the road.	Contractor	Construction
Heavy construction vehicles should be restricted to off-peak periods.	Contractor	Construction
Abnormal load vehicles require specific permit for transporting loads, and require liaison with relevant road authorities to ensure route suitability.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Vehicles keeping to the speed limits.</li> <li>» Vehicles are in good working order and safety standards are implemented.</li> <li>» Local residents and road users are aware of vehicle movements and schedules.</li> <li>» No construction traffic related accidents are experienced.</li> <li>» Local road conditions and road surfaces are up to standard.</li> <li>» Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Developer and or appointed EO must monitor indicators listed above to ensure that they have been implemented.</li> </ul>

**OBJECTIVE 13: Appropriate handling and management of waste**

The construction of the PV 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 activities include:

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

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Access roads.</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Inefficient use of resources resulting in excessive waste generation.</li> <li>» Litter or contamination of the site or water through poor waste management practices.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Packaging.</li> <li>» Other construction wastes.</li> <li>» Hydrocarbon use and storage.</li> <li>» Spoil material from excavation, earthworks and site preparation.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To comply with waste management legislation.</li> <li>» To minimise production of waste.</li> <li>» To ensure appropriate waste storage and disposal.</li> <li>» To avoid environmental harm from waste disposal.</li> <li>» A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
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
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties, and that the waste is disposed of at dumping site as approved by the Council.	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 the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
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
All liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use.	Contractor	Duration of contract
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.
A hydrocarbon spill management plan must be put in place, to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment may occur on site, unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Contractor	During Contract
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	Contractor	Duration of construction



Mitigation: Action/Control	Responsibility	Timeframe
above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.		
Under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor	Duration of construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the 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
Litter generated by the construction crew must be collected in rubbish bins and disposed of weekly, or at an appropriate frequency, at registered waste disposal sites.	Contractor	Duration of construction
All building rubble, solid and liquid waste etc. generated during the construction activities must be disposed of as necessary at an appropriately licensed refuse facility.	Contractor	Duration of construction
Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires will be allowed on site.	Contractor	Duration of construction
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project and that the waste is disposed of at dumping site as approved by the Council.	Contractor	Duration of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> <li>» Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately.</li> <li>» Provision of all appropriate waste manifests for all waste streams.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of waste management practices throughout construction phase.</li> <li>» Waste collection will be monitored on a regular basis.</li> <li>» Waste documentation completed.</li> <li>» Proof of disposal of sewage at an appropriate wastewater treatment works.</li> <li>» 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.</li> </ul>

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

**OBJECTIVE 14: Appropriate handling and storage of chemicals and/or 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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Laydown areas.</li> <li>» Temporary hydrocarbon and chemical storage areas.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Release of contaminated water from contact with spilled chemicals.</li> <li>» Generation of contaminated wastes from used chemical containers.</li> <li>» Soil pollution.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Vehicles associated with site preparation and earthworks.</li> <li>» Construction activities of area and linear infrastructure.</li> <li>» Hydrocarbon spills by vehicles and machinery during levelling, vegetation clearance and transport of workers, materials and equipment and fuel storage tanks.</li> <li>» Accidental spills of hazardous chemicals.</li> <li>» Polluted water from wash bays and workshops.</li> <li>» Pollution from concrete mixing.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons.</li> <li>» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.</li> <li>» Prevent and contain hydrocarbon leaks.</li> <li>» Undertake proper waste management.</li> <li>» Store hazardous chemicals safely in a bunded area.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Implement an emergency preparedness plan during the construction phase.	Contractor	Duration of Contract
Any liquids stored on site, including fuels and lubricants, should be stored in accordance with applicable legislation.	Contractor	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
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: <ul style="list-style-type: none"> <li>» Designated area;</li> <li>» All applicable safety signage;</li> <li>» Firefighting equipment;</li> <li>» Enclosed by an impermeable bund;</li> <li>» Protected from the elements,</li> <li>» Lockable;</li> <li>» Ventilated; and</li> </ul>	Contractor	Duration of Contract

Mitigation: Action/Control	Responsibility	Timeframe
» Has adequate capacity to contain 110% of the largest container contents.		
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. Check vehicles and machinery daily for oil, fuel and hydraulic fluid leaks and undertake regular high standard maintenance on vehicles.	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.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within an appropriate bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1 and any relevant by-laws.	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
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

Mitigation: Action/Control	Responsibility	Timeframe
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
As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site.	Contractor	Construction
All chemicals and toxicants used during construction must be stored in bunded areas.	Contractor	Construction
All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site (pre-use inspection).	Contractor	Construction
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	Contractor	Construction
Have appropriate action plans on site, and training for contactors and employees in the event of spills, leaks and other potential impacts to the aquatic systems. All waste generated on-site during construction must be adequately managed.	Contractor	Construction
Should a chemical spill take place, an aquatic ecologist must be contracted to identify the extent of the impact and assist with additional mitigation measures.	Contractor	Construction
Minimise fuels and chemicals stored on site.	Contractor	Construction
Install bunds on storage areas and take other precautions to reduce the risk of spills.	Contractor	Construction
Implement a contingency plan to handle spills, so that environmental damage is avoided.	Contractor	Construction
No refuelling, servicing of plant/equipment or chemical substance storage allowed outside of designated areas.	Contractor	Construction
Drip trays should be used during all fuel/chemical dispensing.	Contractor	Construction
Drip trays to be placed beneath standing machinery/plant.	Contractor	Construction
In the case of petrochemical spillages, the spill should be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).	Contractor	Construction
Implement a regional (industrial area-wide) emergency response plan with involvement by the local authorities as well as alarms and communication systems which allow for fast and effective communication to neighbouring facilities. The area around the site is sparsely populated, so any impact would not be experienced by a large number of people.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No chemical spills outside of designated storage areas.</li> <li>» No water or soil contamination by spills.</li> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> <li>» Safe storage of hazardous chemicals.</li> <li>» Proper waste management.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase.</li> </ul>

- » 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 15: Effective management of concrete batching plant**

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 storm water include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Batching plant.</li> <li>» Stormwater system.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Dust emissions.</li> <li>» Release of contaminated water.</li> <li>» Generation of contaminated wastes from used chemical containers.</li> <li>» Inefficient use of resources resulting in excessive waste generation.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Operation of the batching plant.</li> <li>» Packaging and other construction wastes.</li> <li>» Hydrocarbon use and storage.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
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
Concrete batching plants should be sited away from identified sensitive areas.	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

Mitigation: Action/control	Responsibility	Timeframe
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	Contractor	Construction phase
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage.	Contractor	Construction phase
Process wastewater collected from the entire batching plant area should be diverted to an impervious settling tank or pond. Water should be reused in the concrete batching process, where possible.	Contractor	Construction phase
A contaminated storm water system must be specifically designed for the batching plant to ensure effective control of contaminated storm water 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

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints regarding dust</li> <li>» No water or soil contamination by chemical spills</li> <li>» No complaints received regarding waste on site or indiscriminate dumping</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase.</li> <li>» 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.</li> <li>» An incident and non-conformance register will be used to record incidents and non-conformances to the EMPr.</li> <li>» The appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> </ul>

### 6.3 Detailing Method Statements

**OBJECTIVE 16: 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).
- » Storm water 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 17: 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 Main Street 1886 Proprietary Limited 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 18: 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 DFFE 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. The report must be submitted 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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Construction camps.</li> <li>» Laydown areas.</li> <li>» Access roads.</li> <li>» Ancillary buildings.</li> </ul>
<b>Potential Impact</b>	» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Temporary construction areas.</li> <li>» Temporary access roads/tracks.</li> <li>» Other disturbed areas/footprints.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure and encourage site rehabilitation of disturbed areas.</li> <li>» Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Implement an appropriate Revegetation and Rehabilitation Plan.	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
Laydown areas and construction camps are to be checked for spills of substances such as oil, paint, etc. Any spills recorded must be cleaned up and the contaminated soil appropriately disposed of.	Contractor	Following completion of construction activities in an area



Mitigation: Action/Control	Responsibility	Timeframe
All voids must be backfilled. Any gullies or dongas must also be backfilled.	Contractor	Following completion of construction activities in an area
Where disturbed areas are not to be used during the operation of the PV facility, these areas must be rehabilitated/re-vegetated with appropriate natural indigenous vegetation and/or local seed mix. A seed mix must be applied to rehabilitated and bare areas. No exotic plants must be used for rehabilitation purposes. No grazing must be permitted to allow for the recovery of the area.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
The area must be shaped to a natural topography. Trees (or vegetation stands) removed must be replaced.	Contractor	Following completion of construction activities in an area
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
Compacted areas must be ripped (perpendicularly) to a depth of 300mm, 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
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation. Soils must be replaced in the correct sequence / profile.	Contractor	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.	Contractor in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage systems if necessary.	Contractor 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.	Contractor	Post-rehabilitation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» All portions of the site, including construction equipment camp and working areas, cleared of equipment and temporary facilities.</li> <li>» Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas.</li> <li>» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites.</li> <li>» Completed site free of erosion and alien invasive plants.</li> </ul>
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**Monitoring**

- » Rehabilitated areas 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 rehabilitated to a satisfactory level.
- » 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 PV2 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.

### 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 **Power Station 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 Environment Forestry and Fisheries (DFFE) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the 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.

**OBJECTIVE 2: Limit the ecological footprint of the PV Plant**

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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Access roads.</li> <li>» Rehabilitated areas.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of vegetation and/or habitat in surrounding areas.</li> <li>» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Avifaunal collisions with PV panels</li> <li>» Fauna entrapped along perimeter fencing</li> <li>» Human presence</li> <li>» Movement of vehicles to and from the site.</li> <li>» Presence of the PV infrastructure and site fencing.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Maintain minimised footprints of disturbance of vegetation/habitats on-site.</li> <li>» Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Rehabilitate disturbed areas should the previous attempt be unsuccessful.	Developer	Operation
Access to adjacent areas to be strictly controlled.	Developer	Operation
All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises, nocturnal and crepuscular species.	Developer	Operation
Maintain and augment natural vegetation around the proposed project	Developer	Operation
Vegetation control should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner.	Developer	Operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Developer	Operation
Soil surfaces where no revegetation seems possible will have to be covered with gravel or small rock fragments to increase porosity	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
of the soil surface, slow down runoff and prevent wind and water erosion.		
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.	Developer	Operation
If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.	Developer	Operation
Maintenance of the perimeter fencing must ensure that it minimises impacts on species susceptible to entrapment.	Developer	Operation
Vehicle movements must be restricted to designated access roads.	Developer	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Developer	Operation
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).	Developer	Operation
Develop and implement an appropriate stormwater management plan for the operation phase of the facility.	Developer	Operation
Site access should be controlled and only authorised staff and contractors should be allowed on-site.	Developer	Operation
No harvesting of plants for firewood, medicinal or any other purposes are to be permitted	Developer	Operation
No killing and poaching of any wild animal to be allowed. This should be clearly communicated to all employees, including subcontractors.	Developer	Operation
Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities must be removed to a safe location.	Developer	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Developer	Operation
Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified.	Developer	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Limited soil erosion around site.</li> <li>» Limited disturbance to vegetation or avifauna and terrestrial faunal habitats.</li> <li>» Continued improvement of rehabilitation efforts.</li> <li>» Removal to safety of entrapped/injured fauna or avifauna encountered during routine maintenance.</li> <li>» Low impact on nocturnal and crepuscular species along roads</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation on-site by environmental manager.</li> <li>» Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.</li> </ul>

### OBJECTIVE 3: Avifauna Impacts

Indirect impacts on avifauna during operation could result from maintenance activities and the movement of people and vehicles on site and potential collision with infrastructure.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Access roads.</li> </ul>
<b>Potential Impact</b>	» Mortality and disturbance of avifauna within and beyond the footprint of the facility due to collisions with solar panels, presence of personnel and vehicle traffic
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Avifaunal collisions with PV panels</li> <li>» Human presence</li> <li>» Movement of vehicles to and from the site.</li> </ul>
<b>Mitigation: Target/Objective</b>	» Zero bird mortalities due to collision trauma caused by PV panels

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Develop and implement an systematic operation phase monitoring programme to record fauna and avifauna movement through the development footprint as well record fatalities. The monitoring programme must include carcass counts. Carcass surveys with a minimum of 2 x 3 day surveys during a six month period (including the peak wet season).	Developer	Operation

<b>Performance Indicator</b>	» Removal to safety of entrapped/injured avifauna encountered during routine maintenance.
<b>Monitoring</b>	» Regular inspections to monitor bird mortalities

### OBJECTIVE 4: Erosion Management

The large amount of disturbance created during construction would leave the site highly vulnerable to erosion. The site is steep in some areas and along with friable soils, the disturbance created at construction will render the impacted areas highly vulnerable to erosion and measures to limit erosion will need to be implemented. This impact is likely to manifest during construction and would persist into the operation phase and should therefore be assessed for both phases.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV facility, including access roads.</li> <li>» Areas disturbed during the construction phase and subsequently rehabilitated at its completion.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of vegetation and/or habitat.</li> <li>» Loss of soil resources.</li> <li>» Sedimentation of water resources</li> </ul>

<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Stormwater runoff from panels and roads.</li> <li>» Runoff of wash water during cleaning of panels</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Implement appropriate erosion control measures to minimise risk of erosion.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.	O&M Operator	Operation phase
All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.	O&M Operator	Operation phase
Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance must be undertaken, as per the Erosion Management and Rehabilitation Plans for the project.	O&M Operator	Operation phase
All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	O&M Operator	Operation phase
All cleared areas must be revegetated with indigenous perennial shrubs and succulents from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	O&M Operator	Operation phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No erosion problems resulting from operational activities within the PV facility.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular inspections to monitor erosion within the site and along access roads.</li> </ul>

### **OBJECTIVE 5: 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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Access road.</li> <li>» Associated infrastructure.</li> </ul>
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<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.</li> <li>» Impacts on soil.</li> <li>» Impact on faunal habitats.</li> <li>» Degradation and loss of agricultural potential.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Transport of construction materials to site.</li> <li>» Movement of construction machinery and personnel.</li> <li>» Site preparation and earthworks causing disturbance to indigenous vegetation.</li> <li>» Construction of site access roads.</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> <li>» Routine maintenance work – especially vehicle movement.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To significantly reduce the presence of weeds and eradicate alien invasive species.</li> <li>» To avoid the introduction of additional alien invasive plants to the site.</li> <li>» To avoid distribution and thickening of existing alien plants in the site.</li> <li>» To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the site.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Develop and implement an IAP Control and Eradication Programme.	Developer	Operation
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> <li>» Keep disturbance of indigenous vegetation to a minimum.</li> <li>» Rehabilitate disturbed areas as quickly as possible.</li> <li>» Do not import soil from areas with alien plants.</li> </ul>	Developer	Operation
Annual monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan to be developed for the site. 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.	Developer	Operation
Eradicate all weeds and alien invasive plants as far as practically possible and ensure that material from invasive plants are adequately destroyed and not further distributed.	Developer	Operation
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species	Developer	Operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Developer	Operation

<b>Performance Indicator</b>	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
<b>Monitoring</b>	» On-going monitoring of area by EO during construction.

	<ul style="list-style-type: none"> <li>» Annual audit of development footprint and immediate surroundings by qualified botanist.</li> <li>» 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.</li> <li>» The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site.</li> <li>» The environmental manager/site agent should be responsible for driving this process.</li> <li>» Reporting frequency depends on legal compliance framework.</li> </ul>
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**OBJECTIVE 6: Minimise dust and emissions to air**

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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Gravel roads and surfaces.</li> <li>» On-site vehicle movement.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Dust and particulates from vehicle movement to and on-site.</li> <li>» Release of minor amounts of air pollutants (for example NO<sub>2</sub>, CO and SO<sub>2</sub>) from vehicles.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Re-entrainment of deposited dust by vehicle movements.</li> <li>» Wind erosion from unsealed roads and surfaces.</li> <li>» Fuel burning vehicle engines.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure emissions from all vehicles are minimised, where possible.</li> <li>» To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.</li> <li>» To ensure emissions from the power generation process are minimised.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Implement appropriate dust suppression measures on a regular basis in any exposed surfaces.	Developer	Operation
Re-vegetation of cleared areas as soon as practically feasible.	Developer	Operation
Speed of vehicles must be restricted on site to 40km/hr.	Developer	Operation
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Developer	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints from affected residents or community regarding dust or vehicle emissions.</li> <li>» Dust suppression measures implemented where required.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance or dust to the Power Station Manager.</li> <li>» 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.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> </ul>

**OBJECTIVE 7: 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 J**):

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV Array and BESS.</li> <li>» Associated buildings</li> </ul>
<b>Potential Impact</b>	» 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.
<b>Activities/Risk Sources</b>	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Provide adequate firefighting equipment on site and establish a fire-fighting management plan during operation.	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

Mitigation: Action/Control	Responsibility	Timeframe
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
Should panels be required to be replaced, the following will apply: <ul style="list-style-type: none"> <li>» Materials and panels are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur.</li> <li>» 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.</li> <li>» 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 relevant waste management regulations. No waste materials may be left on-site.</li> <li>» Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.</li> </ul>	O&M Contractor	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Firefighting equipment and training provided before the operation phase commences.</li> <li>» Appropriate fire breaks in place.</li> <li>» Appropriate procedures followed in the event of replacement of PV panels.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» The O&amp;M operator must monitor indicators listed above to ensure that they have been met.</li> </ul>

### **OBJECTIVE 9: Minimisation of visual impact**

<b>Project component/s</b>	» The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, workshop, etc.)
<b>Potential Impact</b>	» Visual impact of facility degradation and vegetation rehabilitation failure
<b>Activity/risk source</b>	» The viewing of the above mentioned by observers on or near the site.
<b>Mitigation: Target/Objective</b>	» Well maintained and neat facility.

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility as a whole, including the PV panels, servitudes and the ancillary structures.	O&M Operator	Operation phase
Maintain roads and servitudes to forego erosion and to suppress dust.	O&M Operator	Operation and maintenance
Monitor rehabilitated areas, and implement remedial action as and when required.	O&M Operator	Operation phase

Mitigation: Action/control	Responsibility	Timeframe
Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites.	O&M Operator	Operation phase

<b>Performance Indicator</b>	» Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.
<b>Monitoring and Reporting</b>	» Monitoring of the entire site on an ongoing basis by the operator.

### **OBJECTIVE 9: Minimise impacts related to traffic management**

<b>Project Component/s</b>	» Operation and maintenance vehicles.
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact of vehicles on road surfaces, and possible increased risk in accidents involving people and animals.</li> <li>» Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Operation and maintenance vehicle movement.</li> <li>» Speeding on local roads.</li> <li>» Degradation of local road conditions.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimise impact of traffic associated with the operation and maintenance of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users.</li> <li>» To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction.</li> <li>» To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that, at all times, people have access to their properties as well as to social facilities.	Developer	Operation
Vehicles used for operation and maintenance purposes should be inspected regularly to ensure their road-worthiness.	Developer	Operation
Strict vehicle safety standards should be implemented and monitored.	Developer	Operation
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.	Developer	Operation
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Developer	Operation
Provide clearly defined roadway, parking and pedestrian walkway areas within the site with adequate lighting	Developer	Operation
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Developer	Operation
Provide clearly defined roadway, parking and pedestrian walkway areas with adequate lighting.	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Staff and general trips to the site should occur outside of peak traffic periods.	O&M Contractor	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Vehicles keeping to the speed limits.</li> <li>» Vehicles are in good working order and safety standards are implemented.</li> <li>» Local residents and road users are aware of vehicle movements and schedules.</li> <li>» Local road conditions and road surfaces are up to standard.</li> <li>» Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Environmental manager must monitor indicators listed above to ensure that they have been implemented.</li> </ul>

### **OBJECTIVE 10: 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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV facility.</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Inefficient use of resources resulting in excessive waste generation.</li> <li>» Litter or contamination of the site or water through poor waste management practices.</li> <li>» Contamination of water or soil because of poor materials management.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Transformers, switchgear and supporting equipment.</li> <li>» Workshop / control room.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Comply with waste management legislation.</li> <li>» Minimise production of waste.</li> <li>» Ensure appropriate waste disposal.</li> <li>» Avoid environmental harm from waste disposal.</li> <li>» Ensure appropriate storage of chemicals and hazardous substances.</li> </ul>

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.	Developer	Operation
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Developer	Operation and maintenance
Storage areas for hazardous substances must be appropriately sealed and banded.	Developer	Operation
Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
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.	Developer	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.	Developer	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.	Developer	Operation and maintenance
All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.	Developer	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Developer	Operation
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.	Developer	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.	Developer	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Developer	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Developer	Operation
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	Developer	Operation
Separation and recycling of different waste materials should be supported.	Developer	Operation
Should a chemical spill take place, an aquatic ecologist must be contracted to identify the extent of the impact and assist with additional mitigation measures.	Developer	Operation
Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.	Developer	Operation
Regular quality monitoring of waste before discharge.	Developer	Operation
The dirty water dam will need to be lined to prevent any seepage of waste water.	Developer	Operation
Emergency response arrangements and systems such as foam pourers, fire-fighting systems and cooperation with emergency responders. Preventive measures could include maintenance	Developer	Operation



Mitigation: Action/Control	Responsibility	Timeframe
procedures to prevent the occurrence of a catastrophic loss of containment, as well as strict control of ignition sources and other measures which may be required according to standards such as those prescribed by the South African National Standards system.		
<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> <li>» Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately.</li> <li>» Provision of all appropriate waste manifests.</li> <li>» No contamination of soil or water.</li> </ul>	
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Waste collection must be monitored on a regular basis.</li> <li>» Waste documentation must be completed and available for inspection.</li> <li>» An incidents/complaints register must be maintained, in which any complaints from the community must be logged.</li> <li>» Complaints must be investigated and, if appropriate, acted upon.</li> <li>» 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&amp;M operator.</li> <li>» All appropriate waste disposal certificates accompany the monthly reports.</li> </ul>	

### OBJECTIVE 10: Appropriate operation and maintenance of Battery Energy Storage System

<b>Project Component/s</b>	» Integrated Energy Storage System
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Fire and safety risks</li> <li>» Leakages and impacts on soils and water resources</li> </ul>
<b>Activities/Risk Sources</b>	» Inappropriate operation and maintenance of BESS
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential risk of associated with the operation and maintenance of the BESS.

Mitigation: Action/Control	Responsibility	Timeframe
Compile a procedure for the safe handling of battery cells	O&M Contractor/ Project Company	Operation
Ensure that battery supplier user guides, safety specifications and MSDS are filed on site at all times.	O&M Contractor / Project Company	Operation
Operate, maintain and monitor the BESS as per supplier specifications.	O&M Contractor / Project Company	Operation
Compile method statements for approval by the Technical/SHEQ Manager for battery cell, electrolyte and battery cell/ container replacement. Maintain method statements on site.	O&M Contractor / Project Company	Operation
Ensure that all maintenance contractors/ staff are familiar with the supplier's specifications.	O&M Contractor / Project Company	Operation
Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock.	O&M Contractor / Project Company	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Provide signage on site specifying how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. toxic fumes).	O&M Contractor / Project Company	Operation
Maintain suitable firefighting equipment on site.	O&M Contractor / Project Company	Operation
Maintain strict access control to the battery storage area.	O&M Contractor / Project Company	Operation
Undertake regular visual checks on BESS equipment to identify signs of damage or leaks.	O&M Contractor / Project Company	Operation
Provide environmental awareness training to all personnel on site. Training should include discussion of: <ul style="list-style-type: none"> <li>• Potential impact of electrolyte spills on groundwater;</li> <li>• Suitable disposal of waste and effluent;</li> <li>• Key measures in the EMPr relevant to worker's activities;</li> <li>• How incidents and suggestions for improvement can be reported.</li> </ul> Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	O&M Contractor / Project Company	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» BESS operated and maintained in accordance with supplier specifications.</li> <li>» Appropriate signage on site.</li> <li>» Employees appropriately trained.</li> <li>» Required documentation available on site.</li> <li>» Firefighting equipment and training provided before the operation phase commences.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» The O&amp;M contractor/ Project Company must monitor indicators listed above to ensure that they have been met.</li> </ul>

## CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING

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The lifespan of the proposed Kiara PV2 Facility will be 20 – 30 years. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. The lifespan of the PV2 could be extended depending on the condition of the infrastructure. An assessment will be undertaken prior to the end of the lifecycle of the plant to determine whether the plant should be decommissioned or whether the operation of the plant should continue.

It is most likely that decommissioning activities of the infrastructure of the facility discussed in the EIA process would comprise the disassembly, removal and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of waste from the site and rehabilitation to the desired end-use. Future use of the site after decommissioning of the PV2 could possibly form part of an alternative industry that would be able to utilise some of the existing infrastructure associated with the facility. This would however be dependent on the development plans of the area at the time.

As part of the decommissioning phase the developer will undertake the required permitting processes applicable at the time of decommissioning.

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

### 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 and appropriately disposed of.
- » 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.
- » 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 (unless otherwise dictated by the future land use) to allow revegetation of the site.
- » Monitor rehabilitated areas quarterly for at least three years (expected) 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.

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### **Heritage**

Heritage Impact Assessments				
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**APPENDIX A:  
FACILITY LAYOUT AND SENSITIVITY MAPS**

**APPENDIX B:**  
**GRIEVANCE MECHANISM FOR COMPLAINTS AND ISSUES**



**APPENDIX C:  
OPEN SPACE MANAGEMENT PLAN**

**APPENDIX D:  
RE-VEGETATION AND HABITAT REHABILITATION PLAN**

**APPENDIX E:  
PLANT RESCUE AND PROTECTION PLAN**

**APPENDIX F:  
TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN**

**APPENDIX G:  
STORMWATER AND EROSION MANAGEMENT PLAN**

**APPENDIX H:  
WASTE MANAGEMENT PLAN**

**APPENDIX I:  
EMERGENCY PREPAREDNESS, RESPONSE AND FIRE  
MANAGEMENT PLAN**



**APPENDIX J:  
CURRICULCUM VITAE OF THE PROJECT TEAM**