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**PROPOSED BOSJESMANSBERG PV EAST  
SOLAR ENERGY FACILITY NEAR COPPERTON,  
NORTHERN CAPE PROVINCE**

DEA Reference: 14/12/16/3/3/2/579/1

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**DRAFT ENVIRONMENTAL MANAGEMENT  
PROGRAMME**

Submitted as part of the Draft Environmental Impact  
Assessment Report

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## PROJECT DETAILS

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## DEFINITIONS AND TERMINOLOGY

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**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.

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

**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.

**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

**'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.

**Drainage:** A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may or may not be present

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

**Environmental impact assessment:** Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

**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:** An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

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

**Heritage:** That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

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

**Indirect impacts:** Indirect or induced changes that may occur as a result 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 as a result of the activity.

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

**Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

**Riparian:** the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

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

**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.

**Watercourse:** as per the National Water Act means -  
(a) a river or spring;

- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

**Wetlands:** land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

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## PROJECT DETAILS

## CHAPTER 1

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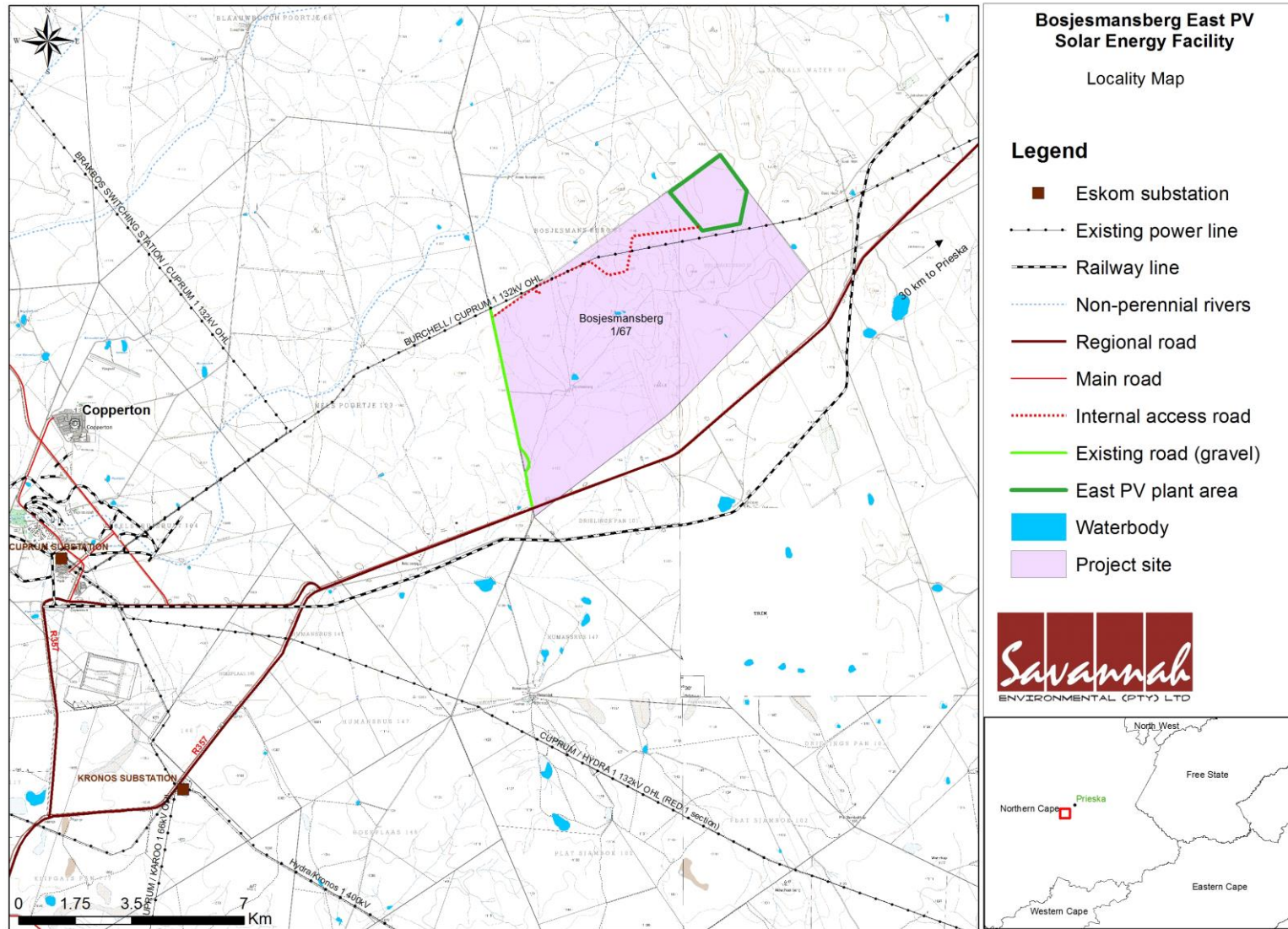
**Networx Renewables (Pty) Ltd** (Networx) is proposing to establish a commercial photovoltaic solar energy facility with a net generating capacity of up to 75MW, as well as associated infrastructure on a site located in the Northern Cape Province approximately 16km east of Copperton (refer to **Figure 1.1**).

The Bosjesmansberg PV East Solar Energy Facility is proposed on Portion 1 of the farm Bosjesmansberg 67 on a 337ha area of Portion 1 of the farm Bosjesmansberg 67, which encompasses a total area of 5 350ha in extent.

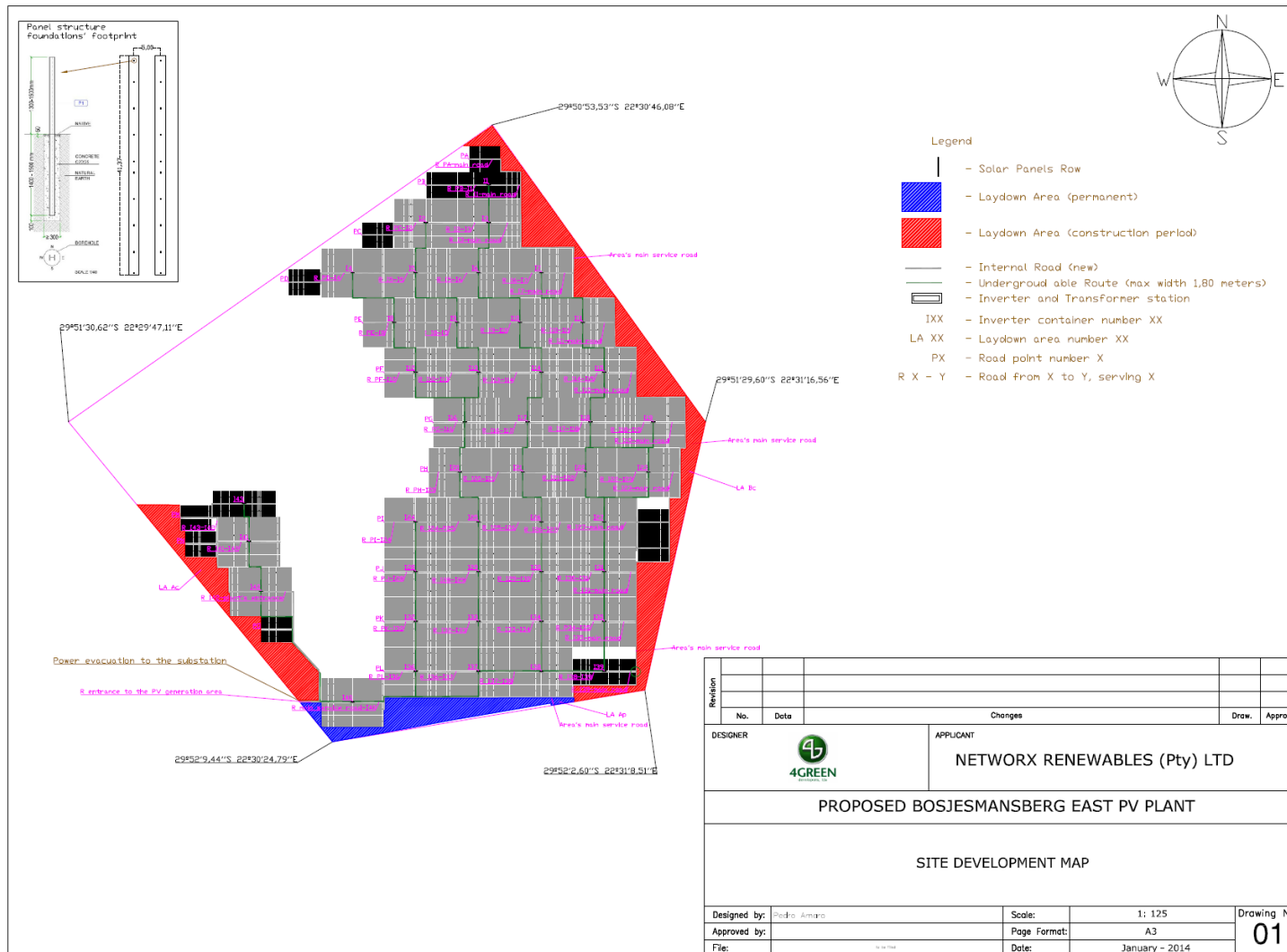
The final PV facility footprint is proposed to be built over an area approximately 200ha in extent, and will include several arrays of photovoltaic (PV) solar panels with a generating capacity of up to 75 MW and includes the following associated infrastructure:

- » Arrays of PV panels and respective inverter stations
- » Appropriate mounting structures
- » Cabling between the project components, to be lain underground where practical
- » An on-site substation including a building for control and storage
- » An overhead power line to facilitate the connection between the on-site substation and the Eskom grid via a loop in/loop out configuration to the Cuprum-Burchell 132kV power line which traverses the greater farm portion.
- » Permanent laydown areas
- » Laydown areas for the construction phase
- » Internal access roads
- » Fencing.

**Figure 1.2** provides the preliminary layout of the facility as provided by Networx



**Figure 1.1:** Locality map showing the broader study site identified for the proposed facility



**Figure 1.2:** Layout map for Bosjesmansberg PV East Solar Energy Facility

## **2.1. Activities and Components associated with the Solar Energy Facility**

In order to construct the solar energy facility and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases which are discussed in more detail below.

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

#### **Conduct Surveys**

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

A power line servitude survey will also be conducted. If necessary, a walk through survey will be undertaken for ecological/heritage resources prior to construction.

### **2.1.2. Construction Phase**

The construction of the Bosjesmansberg PV East Solar Energy Facility is expected to extend over a period of approximately 18-24 months and create approximately 500 employment opportunities at peak and depending on the final design. Of this total ~ 60% (300) will be available to low-skilled workers (construction labourers, security staff etc.), 10% (50) to semi-skilled workers (drivers, equipment operators etc.) and 30% (150) to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community, representing a significant positive social benefit in an area with limited employment opportunities. The construction phase will entail a series of activities including:

**Undertake Site Preparation:** Site preparation involves construction of new access roads and improvement of existing on-site construction access roads with compacted native soil, installation of drainage crossings, setup of construction staging areas, storm water management work, preparation of land areas for array installation, and other activities needed before installation of the solar arrays can

begin. The work would involve trimming of vegetation, selected compacting and grading, and setup of modular offices and other construction facilities. Site preparation would occur for each 2 to 20MW area(0.75ha – 7.5ha at a time) in order to minimise the area of ground exposed at any one time.

**Establish access roads:** Access roads to PV East will be required to be constructed. The broader farm is adjacent to the R357 presenting access via an existing access road which runs parallel to the Eastern portion of the broader farm. A new section of road of 8km in length and 3.5m in width is required to be constructed from this point to provide access the PV East site boundary. Access roads will need to cross ecologically sensitive areas (including rocky areas and washes) of the site in order to access the PV East site. Internal access roads adjacent to the on-site substation accessing the PV arrays will also be required. The cumulative length of internal roads between the PV arrays will be approximately 15km.

**Transport of Components and Construction Equipment to Site:** The components for the proposed facility will be transported to site by road. Some of the substation components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)<sup>1</sup> by virtue of the dimensional limitations (i.e. size and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.), as well as the components required for the establishment of the substation and power line.

**Establishment of Construction Equipment Camp:** Once the required equipment has been transported to site, a construction equipment camp will need to be established for each phase. The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with each phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility at the construction camp, so as to prevent the possibility of leakages and soil contamination. It is anticipated that not more than 20 000 litres of fuel stored on site at one time for the refuelling of vehicles and machinery will be required. Fuel stored on site will be stored in a steel tank/s within a secured and bunded area.

**Construction Crew Accommodation Camp:** The majority of construction workers are likely to be accommodated in Prieska however construction crew accommodation camps may be required if accommodation in and around Copperton

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<sup>1</sup> A permit will be required for the transportation of these abnormal loads on public roads.

and Prieska is not sufficient, also considering the number of potential employment opportunities created due to other solar energy facilities proposed to be developed around the Copperton areas. The location of worker accommodation camps are required to be outside of identified sensitive areas and on agreement with the landowner and therefore cannot be mapped at this time (although are likely to be situated in close proximity to the contractors camps). Accommodation camps would be electrified and will include formalised ablution facilities, cooking facilities and waste disposal facilities.

**Installation of the PV Power Plant:** The construction phase involves installation of the solar PV panels and the entire necessary structural and electrical infrastructure to make each 75MW project operational. In addition, preparation of the soil and improvement of the access roads would continue throughout the majority of the construction process. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different foundation method, such as screw pile, helical pile, micropile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV modules would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables connect the Power Conversion Stations (PCS) to the on-site substation.

**Establishment of Ancillary Infrastructure:** Ancillary infrastructure for the project will include a workshop, construction and operational laydown areas and an office. Temporary construction phase laydown and permanent laydown areas are planned to be situated adjacent to the PV arrays. The establishment of these areas/facilities/ buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction.

**Construct on-site substation and undertake internal electrical reticulation:** New internal electrical reticulation will be required in order to connect PV East to the 33/132kV (or 22/132kV) on-site substation. Substations are constructed in the following simplified sequence:

- » Step 1: Survey the area
- » Step 2: Final design of the substation and placement of the infrastructure
- » Step 3: Vegetation clearance and construction of access roads (where required)
- » Step 4: Construction of foundations
- » Step 5: Assembly and erection of infrastructure on site



- » Step 6: Connect conductors
- » Step 7: Rehabilitation of disturbed area and protection of erosion sensitive areas
- » Step 8: Continued maintenance

The expected lifespan of the proposed on-site substation associated with PV East is anticipated to be in line with the economic life of the PV project (in excess of 20 years with continued maintenance). During the life-span of the substation, on-going maintenance is performed and inspections are undertaken by Eskom.

**Undertake Site Rehabilitation:** As construction is completed in an area, and as all construction equipment is removed from the project site, the site must be rehabilitated where practical and reasonable.

### ***2.1.3. Operational Phase***

PV East will be operational for a minimum of 20 years, with an opportunity for a lifetime of 50 years or more with equipment replacement and repowering. The project will operate continuously, 7 days a week, during daylight hours, depending on prevailing climatic conditions. While the project will be largely self-sufficient upon completion of construction, monitoring and periodic, as needed maintenance activities will be required. Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operational phase will create 7-15 full-time employment positions. No large-scale energy storage mechanisms for the facility which would allow for continued generation at night or on cloudy days are proposed.

### ***2.1.4. Decommissioning Phase***

Depending on the continued economic viability of the facility following the initial 20-year operational period, the solar energy facility will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to extend the operational phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the facility, the following activities will form part of the project scope.

When the project is ultimately decommissioned, the equipment to be removed will depend on the proposed land use for the site at that time. For example, depending on the power needs at the time of decommissioning, the on-site substations could remain for use by the utility or other industrial activity.

Below is a discussion of expected decommissioning activities.

**Site Preparation:** Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment and possibly establishing areas for placement and storage of decommissioning equipment and machinery.

**Disassemble and Remove Existing Components:** All above-ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will either be removed, or cut off 1m below the ground surface, and the surface restored to the original contours. 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 plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and can be returned to the agricultural or other land-use.

## 2.2. Findings of the Environmental Impact Assessment

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws associated with the proposed site identified for the development of PV East. Potential environmental impacts and some areas of high sensitivity were however identified. In summary, the most significant environmental impacts associated with PV East, as identified through the EIA, include:

- » Impacts on ecology and listed floral species.
- » Impacts on avifauna.
- » Impacts on the local soils, land capability and agricultural potential of the site.
- » Visual impacts mainly due to the solar panels and partly due to other associated infrastructure (power line, access road etc.).
- » Archaeological impacts.
- » Social and economic impacts.
- » Cumulative impacts (due to the number of renewable energy facilities authorised or being considered in the Copperton area).

### » **Impacts on Ecology**

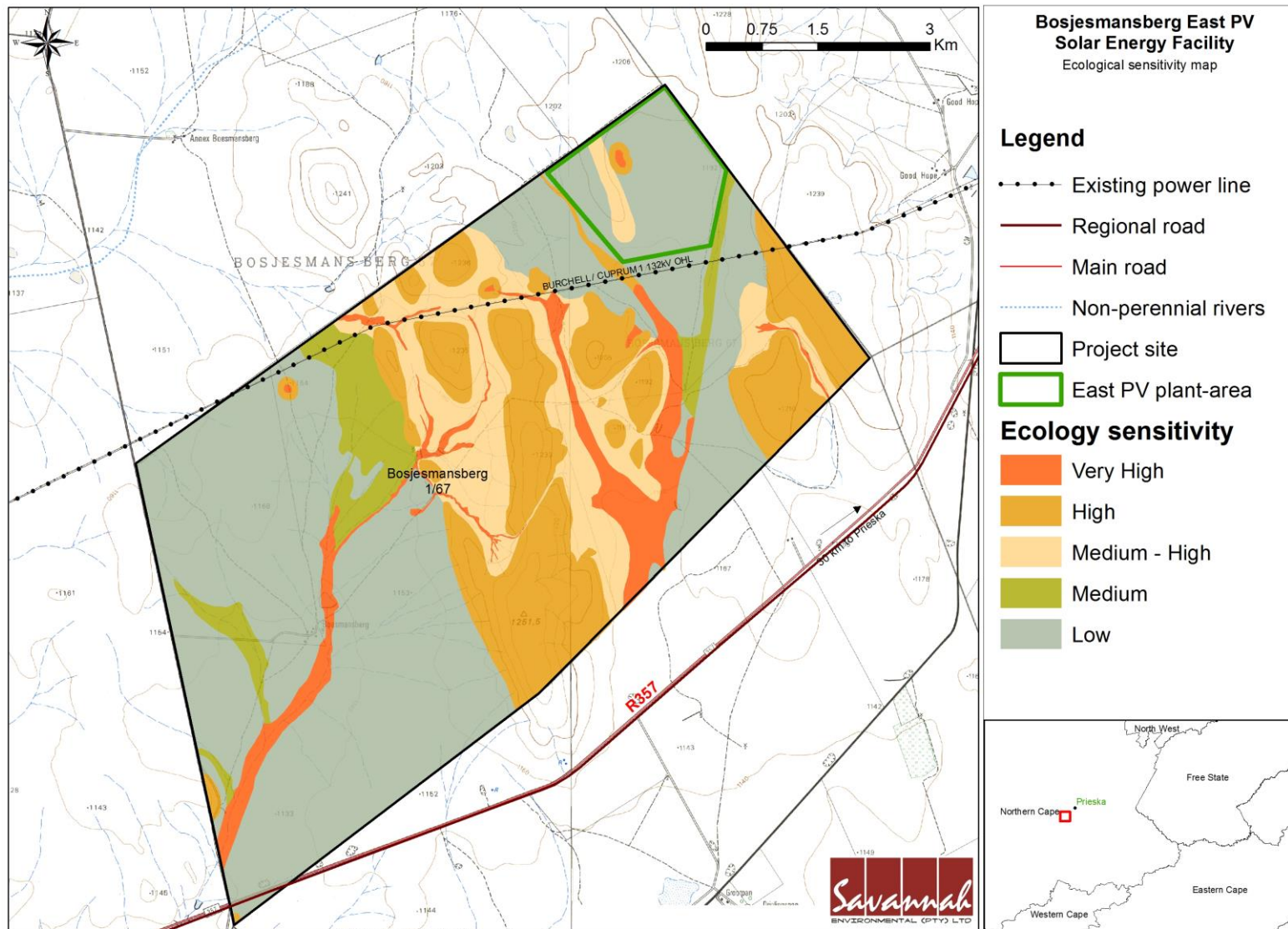
**Sensitive environments:** Approximately 200ha of the Bosjesmansberg PV East site will be utilised for the solar energy facility within the 5 350ha farm portion. The proposed PV East Solar Energy Facility is planned to occur primarily over calcrete areas of low ecological sensitivity as mapped by an ecologist.

The ecological sensitivity assessment identified those parts of PV East that have high conservation value or that may be sensitive to disturbance. The habitats considered most sensitive within the site, and which should be avoided include:

- » A pan and fringing vegetation of very high sensitivity
- » Rocky hills

Access roads will need to cross ecologically sensitive areas (including rocky areas and washes) on the site in order to access the PV East site, in order to avoid the more ecologically sensitive features identified (such as non-perennial drainage lines).

**Listed species:** Two red data-listed plant species are known from the area, *Hoodia gordonii* which is listed as DDD (data deficient, insufficient information) and *Salsola apiciflora* which is listed DDT (Data Deficient – Taxonomically Problematic). There are however a variety of nationally or provincially protected species which can be confirmed present at the site. This includes the nationally protected tree species *Boscia albitrunca* which is common in the rocky hills of the site and occurs occasionally on the calcrete plains as well. Affected individuals can be translocated as their survival probability is high. Other protected species observed at the site include *Hoodia gordonii*, *Hoodia flava* and *Titanopsis calcarea*, *Pachypodium succulentum*, *Mestoklema tuberosum*, *Aloe claviflora* and *Avonia ustulata*. No protected species were particularly abundant within the proposed development areas and it is highly unlikely that the development of the site would significantly impact the local populations of any of the listed species.



**Figure 1.3:** Sensitivity map indicating sensitive ecological areas within the proposed Bosjesmansberg PV East Solar Energy Facility

» ***Impact on Avifauna***

Avifaunal impacts of the larger farm portion, which could extend to PV East are likely to manifest in the disturbance or displacement of resident/migrant species, some of which are protected species. No sensitive avifaunal species were identified to be resident at PV East.

» ***Impact on Soils, Land Capability and Agricultural Potential***

The current land use is livestock (sheep) farming on the site. Soils across the site are generally extremely shallow to shallow, red, sandy soils on underlying rock or calcrete with deeper soils occurring in patches. There is no evidence of significant soil erosion or other soil degradation on the site. Because of the aridity and soil constraints the only possible agricultural land use is small stock grazing. Agricultural potential is fairly uniform across the farm and the choice of placement of the facility on the farm therefore has minimal influence on the significance of agricultural impacts. The major limitations to agriculture are the aridity and the shallow soils limited in depth by rock and calcrete. The development will have low to medium negative impacts on agricultural resources and productivity, but it will also deliver positive impacts on agriculture. The conclusion of this assessment is that from an agricultural impact perspective the development can proceed as proposed, subject to the recommended mitigation measures provided.

» ***Visual Impacts***

The construction and operation of the proposed Bosjesmansberg PV East Solar Energy Facility and its associated infrastructure will have a visual impact on the study area, especially within (but not restricted to) a 10km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility.

Affected visual receptors include people travelling along roads and residents of rural homesteads and settlements. There are no formally protected or conservation areas present within the study area, but the greater environment has a rural and undeveloped character once beyond the small towns and mining areas. Settlements, where these occur, are limited in extent and domestic in scale. This area is not known as a tourist destination, but the greater environment is considered to have a high visual quality. A specific sense of place related to the wide open, undeveloped space characterises the region, but is not particular to this study area.

The potential cumulative visual impact of the various alternative energy facilities proposed within this region. Should enough alternative energy facilities exist, the region will begin to be defined by such. This will have an impact on the Sense of Place. However, considering the relative lack of sensitive visual receptors, tourism, protected areas or conservation spaces, the cumulative visual impact is not considered to be unacceptable in this context.

The study concluded that the significance of anticipated visual impacts are of acceptable significance levels within this receiving environment.

» **Heritage Impacts**

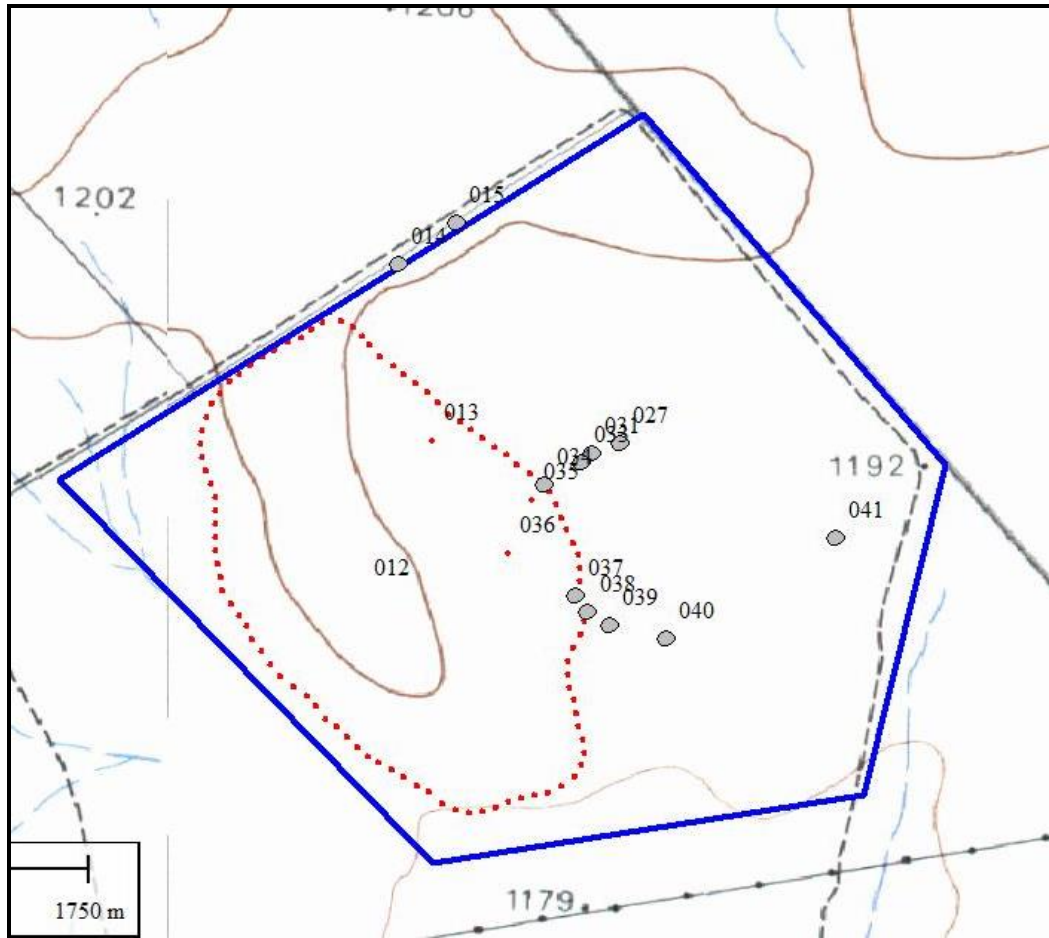
Potential impacts on heritage sites relate to the direct loss of these features during construction. Three heritage sites were identified on the site which require *in-situ* preservation as per the recommendations of the heritage specialist:

- » Site 1 (013 in Figure 1.4 below) consists of a pan located in the north eastern portion of PV East. To the east of the pan is fairly deep Aeolian sand and artefact counts in this area drop drastically. Most of the artefacts in this area consist of Middle Stone Age (MSA) flakes and blades with dorsal and lateral retouch, some pieces show signs of being utilised. All the MSA are on the locally available quartzite. The site falls within a large cluster of a high density artefacts indicated as a heritage sensitive area (Figure 8) Artefact ratio around the pan varies but the highest frequency is found on the eastern and southern side of the pan (>5 per m<sup>2</sup>). The pan is flagged as a no-go area.

S29° 51 26.7 ; E22° 30 24.8

- » Site 2 and 3 (035 and 036 in Figure 1.4 below) - Both sites form part of the demarcated sensitive area in PV East. Site 2 consists of a high density of artefacts (6-10 per m<sup>2</sup>) mostly MSA. Artefacts consist of unretouched flakes, blades, radial cores made mainly on the locally available quartzite. Site 3 consists of a blue-grey quartzite outcrop that is fairly low standing, approximately 30 cm above the surface, with some evidence of flake scarring. This may suggest a source for knapping material. Several MSA flakes and possibly some ESA flakes are found scattered around the area with an artefact density of > 5 per m<sup>2</sup>. The area is characterised by hard packed Aeolian sands on top of calcrete and possible extend over 100m<sup>2</sup>.

S29° 51 32.8 ; E22° 30 34.9  
S29° 51 38.1 ; E22° 30 32.5



**Figure 1.4:** Site distribution map within PV East indicating heritage sensitive area (red dotted line) and sites requiring preservation (shown as 012, 013 and 036)

» ***Social and Economic Impacts***

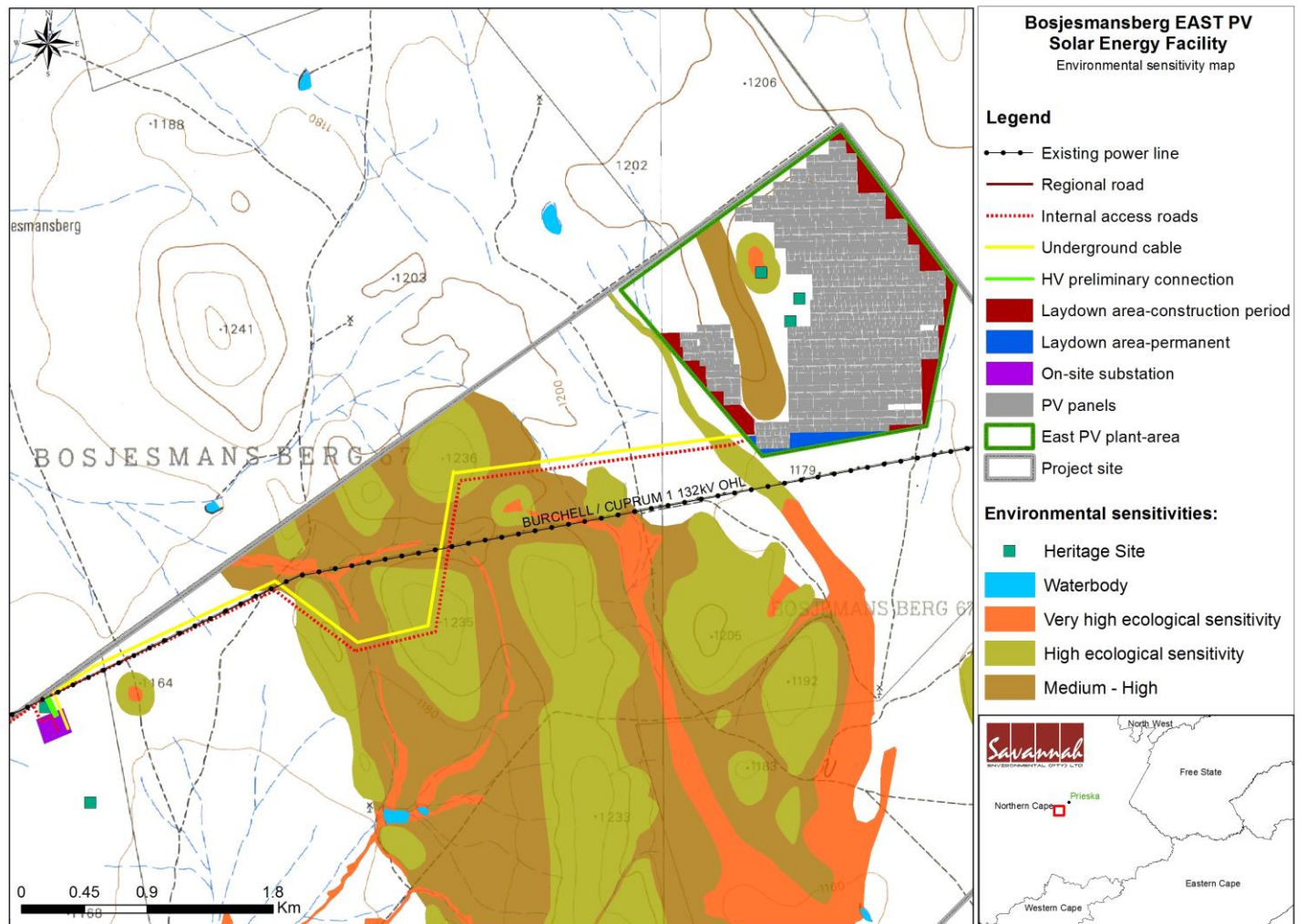
The findings of the Social Impact Assessment indicate that the development of the proposed Bosjesmansberg PV East Solar Energy Facility will create employment and business opportunities for locals during both the construction and operational phase of the project. The enhancement measures listed in the report should be implemented in order to enhance these benefits. In addition, the proposed establishment of a number of other renewable energy facilities in the area will create significant socio-economic opportunities for Prieska and the SLM, which, in turn, will result in a positive social benefit. These benefits will assist to offset the negative impacts associated with the decline in the mining sector over the last 20 or so years.

The establishment of a Community Trust funded by revenue generated from the sale of energy from the proposed Bosjesmansberg PV East Solar Energy Facility also creates an opportunity to support local economic development in the area.

The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The establishment of the proposed project is therefore supported by the findings of the SIA.

However, the potential cumulative impacts associated with wind and solar energy facilities on the areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for renewable energy facilities in the area.





**Figure 1.5:** Environmental Sensitivity map for the proposed Bosjesmansberg PV East Solar Energy Facility

## PURPOSE AND OBJECTIVES OF THE EMPr

## CHAPTER 3

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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 associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced.”<sup>2</sup> The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

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

This Environmental Management Programme has been compiled for the design, construction and operation of the Bosjesmansberg PV East 75MW Solar Energy Facility. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to, updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. 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).

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<sup>2</sup> Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

This EMPr has the following objectives:

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

The management and mitigation measures identified within the Environmental Impact Assessment (EIA) process are systematically addressed in this EMPr, and ensure 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 contract documentation. Since this EMPr is part of the EIA process for the Bosjesmansberg PV East Solar Energy Facility, it is important that this document be read in conjunction with the final Scoping and EIA Reports 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 construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document will be adhered to, and updated as relevant throughout the project life cycle.

## **KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT      CHAPTER 3**

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

- » National Environmental Management Act (Act No. 107 of 1998)
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
- » Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - \* Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  - \* Public Participation in the EIA Process (DEA, 2010)
  - \* Integrated Environmental Management Information Series (published by DEA)
- » Siyathemba Local Municipality Integrated Development Plan (2012)
- » Pixley ka Seme Spatial Development Framework (2006)
- » International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues assessed in this report. A listing of relevant legislation is provided in Table 4.1 and Table 4.2.

**Table 4.1:** Relevant legislative permitting requirements applicable to the proposed Bosjesmansberg PV East Solar Energy Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<b>National Legislation</b>			
National Environmental Management Act (Act No 107 of 1998)	<p>The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations.</p> <p>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>In terms of GN R543, R544, R545 and R546 of 18 June 2010, a Scoping and EIA Process is required to be undertaken for the proposed project.</p>	<p>Department of Environmental Affairs – competent authority</p> <p>Department of Environmental and Nature Conservation (DENC)-commenting authority</p>	<p>The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA).</p> <p>This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.</p>
National Environmental Management Act (Act No 107 of 1998)	<p>In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.</p> <p>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	Department of Environmental Affairs	<p>While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.</p>
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs	Noise impacts are expected to be associated with the construction

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
		Department of Environmental and Nature Conservation (DENC)-  Local Authorities	phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation.  On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays).  Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required). Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c;	Department of Water Affairs  Provincial Department of Water Affairs	A water use license (WUL) is required to be obtained if wetlands or drainage lines are impacted on, or if infrastructure lies within 500m of wetland features or the regulated area of a watercourse (being the riparian zone or the 1:100yr floodline whichever is greatest).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>and altering of bed, banks or characteristics of a watercourse - Section 21i.</p>		<p>Should water be extracted from groundwater/ a borehole on site for use within the facility, a water use license will be required in terms of Section 21(a) and 21 (b) of the National Water Act.</p> <p>The storage of water in reservoirs may also require approval from DWA.</p>
<p>Minerals and Petroleum Resources Development Act (Act No 28 of 2002)</p>	<p>A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.</p> <p>Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.</p> <p>S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.</p>	<p>Department of Mineral Resources</p>	<p>As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.</p> <p>A Section 53 application will be submitted the Northern Cape DMR office.</p>
<p>National Environmental</p>	<p>Measures in respect of dust control (S32)and</p>	<p>Department of</p>	<p>No permitting or licensing</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Management: Air Quality Act (Act No 39 of 2004)	National Dust Control Regulations of November 2013. Measures to control noise (S34) - no regulations promulgated yet.	Environmental Affairs	requirements arise from this legislation. However, National, provincial and local ambient air quality standards (S9 - 10 & S11) to be considered. Measures in respect of dust control (S32) and the National Dust Control Regulations of November 2013. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	<ul style="list-style-type: none"> <li>» Stipulates assessment criteria and categories of heritage resources according to their significance (S7).</li> <li>» Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35).</li> <li>» Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36).</li> <li>» Lists activities which require developers any person who intends to undertake to notify the</li> </ul>	South African Heritage Resources Agency	An HIA and PIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix I). Should a heritage resource be impacted upon, a permit may be required from SAHRA.



Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38).</p> <p>» Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44).</p>		
<p>National Environmental Management: Biodiversity Act (Act No 10 of 2004)</p>	<p>» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53)</p> <p>» A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657.</p> <p>» Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations).</p> <p>» Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of</p>	<p>Department of Environmental Affairs</p>	<p>Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.</p> <p>An ecological study has been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix E.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011).</p> <p>» This Act also regulates alien and invader species.</p>		
<p>Conservation of Agricultural Resources Act (Act No 43 of 1983)</p>	<p>» Prohibition of the spreading of weeds (S5)</p> <p>» Classification of categories of weeds &amp; invader plants (Regulation 15 of GN R1048) &amp; restrictions in terms of where these species may occur.</p> <p>» Requirement &amp; methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).</p>	<p>Department of Agriculture</p>	<p>This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.</p> <p>The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. There are none for this project.</p>
<p>National Forests Act (Act No. 84 of 1998)</p>	<p>According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or</p>	<p>National Department of Forestry</p>	<p>A licence is required for the removal of protected trees. No protected trees were identified for this project. Should any protected</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister’.		trees need to be removed, a permit will be required to be obtained from DAFF.
National Veld and Forest Fire Act (Act 101 of 1998)	<p>In terms of S12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.</p> <p>In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.</p>	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	<p>This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <p>Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other</p>	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>means, cause extreme risk of injury etc., can be declared as Group I or Group II substance                      Group IV: any electronic product; and                      Group V: any radioactive material.                      The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>		
<p>Development Facilitation Act (Act No 67 of 1995)</p>	<p>Provides for the overall framework and administrative structures for planning throughout the Republic.</p> <p>S(2-4) provide general principles for land development and conflict resolution.</p>	<p>Local Municipality</p>	<p>The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.</p>
<p>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)</p>	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> <li>» Adding other waste management activities to the list.</li> <li>» Removing waste management activities from the list.</li> <li>» Making other changes to the particulars on the list.</li> </ul>	<p>National Department of Water and Environmental Affairs (hazardous waste)</p> <p>Provincial Department of Environmental Affairs (general waste)</p>	<p>As no waste disposal site is to be associated with the proposed project, no permit is required in this regard.</p> <p>General waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPs for each Phase (refer to Appendix K-M). The DWAF (1998) Waste Management Series. Minimum</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>In terms of the Regulations published in terms of this Act (GN 718), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> <li>» The containers in which any waste is stored, are intact and not corroded or in</li> <li>» any other way rendered unlit for the safe storage of waste.</li> <li>» Adequate measures are taken to prevent accidental spillage or leaking.</li> <li>» The waste cannot be blown away.</li> <li>» Nuisances such as odour, visual impacts and breeding of vectors do not arise; and</li> <li>» Pollution of the environment and harm to health are prevented.</li> </ul>		<p>Requirements for the Handling, Classification and Disposal of Hazardous Waste will also need to be considered.</p> <p>The volumes of solid waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).</p> <p>The contractor’s camp will result in sewage and grey water handling. Sewage is regarded as hazardous waste in terms of this Act. However the volume of hazardous waste generated from the construction and operation of the facility will not exceed the specified threshold volumes within the Waste Act (i.e. an annual throughout capacity of 2000m<sup>3</sup>) and therefore a waste license from National DEA will not be required.</p>
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the country	Department of Agriculture	Subdivision of land may be required in terms of S24 and S17 of the Act.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Road Traffic Act (Act No 93 of 1996)	<ul style="list-style-type: none"> <li>» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.</li> <li>» Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.</li> <li>» The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</li> </ul>	<ul style="list-style-type: none"> <li>» South African National Roads Agency Limited (national roads)</li> <li>» Provincial Department of Transport</li> </ul>	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
<b>Provincial Legislation</b>			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties	Northern Cape Department of Environment and Nature Conservation	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant species found on site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:</p> <ul style="list-style-type: none"> <li>» Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;</li> <li>» Aquatic habitats may not be destroyed or damaged;</li> <li>» The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.</li> <li>» The Act provides lists of protected species for the Province.</li> </ul>		<p>Additionally, a permit for the disturbance or destruction of indigenous species must be applied for.</p>

**Table 4.2:** Standards and guidelines applicable to the solar energy facility

Theme	Standard/Guidelines	Summary
Air	South African National Standard (SANS) 69	Framework for setting and implementing national ambient air quality standards
	SANS 1929: Ambient Air Quality	Sets limits for common pollutants
Noise	SANS 10328:2003: Methods for Environmental Noise Impact Assessments	General procedure used to determine the noise impact
	SANS 10103:2008: The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication	Provides noise impact criteria
	National Noise Control Regulations	Provides noise impact criteria
	SANS 10210: Calculating and Predicting Road Traffic Noise	Provides guidelines for traffic noise levels
Waste	DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste	DWAF Minimum Requirements
Water	Best Practise Guideline (G1) Stormwater Management DWA 2006	Provides guidelines to the management of storm water
Water	South African Water Quality Guidelines	Provides water quality guidelines
Others	Tokologo Local Municipality, Integrated Development Plan (2010/2011) and Lejweleputswa District Municipality, Integrated Development Plan (2011/2012)	According to the Municipal Systems Act of 2000, all Municipalities have to undertake an Integrated Development Planning (IDP) process to produce Integrated Development Plans (IDPs). As the IDP is a legislative requirement it has a legal status and it supersedes all other plans that guide development at local government level.



**STRUCTURE OF THIS EMPr**

**CHAPTER 4**

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

- » Pre-Construction (Planning & Design) activities;
- » Construction activities;
- » Operation activities; and
- » Decommissioning activities.

These chapters set out the procedures necessary for Networx, as the project developer, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr 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.
<b>Potential Impact</b>	» Description of potential environmental impact if objective is not met.
<b>Activity/Risk Source</b>	» Description of activities which could affect achieving 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?	Periods for implementation.

<b>Performance Indicator</b>	Description of key indicator(s) that track progress/indicate the effectiveness of the EMPr.
<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;
- » 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 or should be modified.

#### 4.1 Project Team

This draft EMPr was compiled by Steven Ingle, senior environmental consultant with over 7 years of experience in the environmental field holding a degree in Environmental Management. His competencies lie in environmental impact assessments for large scale infrastructure, property and mining projects, environmental due diligence and risk assessment, environmental compliance monitoring, waste management licensing and strategic environmental assessment. Specialists involved in the identification and mitigation of impacts include:

<b>Specialist</b>	<b>Area of Expertise</b>
Ecological Impact Assessment	Simon Todd Consulting
Soils and Agricultural Potential Assessment	Johann Lanz Soil Scientist
Visual Impact Assessment	Lourens du Plessis of MetroGIS
Social Impact Assessment	Tony Barbour
Heritage Impact Assessment	Archaeological Contracts and Heritage Consulting (HCAC)
Palaeontology specialist opinion	Dr John Almond of Natura Viva
Avifaunal Impact Assessment	Dr Doug M. Harebottle

## ROLES AND RESPONSIBILITIES

## CHAPTER 5

### 5.1 Roles and Responsibilities for the Construction Phase of the Solar Energy Facility

As the Proponent, Networkx must ensure that the implementation of the Bosjesmansberg PV East solar energy facility complies with the requirements of any and 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. Networkx will retain various key roles and responsibilities during the construction of the solar energy facility. These are outlined below.

Specific responsibilities of the Owner's Representatives; Environmental Control Officer and EPC Contractor for the construction phase of this project are as detailed below.

The **Owner's Representative (i.e. General Manager and/or Site 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 cycle by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully knowledgeable with the EIA for the project, the EMPr, the conditions of the facility Environmental Authorisation, and all relevant environmental legislation.

The **Owner's Engineer (i.e. Project Manager and/or Site manager)** will:

- » Be fully knowledgeable with the contents and conditions of the facility Environmental Authorisation.
- » Be fully knowledgeable with the contents of the EMPr.
- » Have overall responsibility for the implementation of the EMPr .
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » 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<sup>3</sup> **Environmental Control Officer (ECO)** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the EIA.
- » Be fully knowledgeable with the contents with the conditions of the facility Environmental Authorisation.
- » Be fully knowledgeable with the contents with the EMPr.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMPr conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that appropriate measures are undertaken to address any non-compliances recorded.
- » 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 the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Independently report to DEA in terms of compliance with the specifications of the EMPr and conditions of the facility Environmental Authorisation .
- » Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.

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<sup>3</sup>A person who is not from any of the parties involved in the design or construction of the Solar Energy Facility

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 be considered to be sufficient, provided that compliance with the requirements of the Environmental Authorisation, EMPr and environmental legislation is maintained. In the absence of the ECO there should be a designated environmental officer present to deal with any environmental issues that may arise. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

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

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » A copy of the EMPr must be easily accessible to all on-site staff members.
- » Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
- » Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Staff will be informed of environmental issues as deemed necessary by the ECO.

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

- » Ensuring adherence to the environmental management specifications.
- » Ensuring that appropriate Method Statements are drafted 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 that they can constructively contribute towards the successful implementation of the EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

The **Environmental Officer**, nominated by the Contractor will:

- » be an on-site nominated person (person responsible for Safety, Health, Environment and Quality or SHEQ Officer).
- » be responsible for overseeing day-to-day environmental compliance with the EMP.
- » deal with any environmental issues that may arise.
- » Report issues to the contractor.
- » Report to the ECO during monthly ECO audits.
- » Provide record of authorisations, incidents and non-conformances.

## 5.2. Roles and Responsibilities for the Operation Phase of the Solar Energy Facility

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

The **Facility 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 **Environmental Manager** will:

- » Develop and Implement an Environmental Management System (EMS) for the solar energy facility and associated infrastructure.
- » Manage and report on the facility's environmental performance.

- » Maintain a register of all known environmental impacts and manage the monitoring thereof.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the solar energy 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.

## MANAGEMENT PROGRAMME: PRE-CONSTRUCTION (PLANNING & DESIGN)

### CHAPTER 6

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

- » Ensures that the design of the facility 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, including the access roads and power line alignments.
- » Enables the solar energy facility construction activities to be undertaken without significant disruption to other land uses and activities in the area.

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

#### 6.1 Objectives

##### **OBJECTIVE PD1 : Ensure the facility design responds to identified environmental constraints and opportunities**

The most sensitive landscape features for planning purposes in the study area will be the presence of the pan (100m buffer), three Stone Age archaeological sites (20m buffer), and rocky hills. These features and an associated buffers should be excluded from any development footprint wherever possible.

A stormwater management plan must be compiled (usually done by an engineering company as part of the final design) that details how storm water runoff will be managed to reduce velocities and volumes of water that could lead to erosion of surfaces.

<b>Project Component/s</b>	<ul style="list-style-type: none"><li>» PV panels.</li><li>» Substation.</li><li>» Access roads.</li><li>» Laydown areas and construction camp area</li></ul>
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<b>Potential Impact</b>	» Impact on identified sensitive areas.
<b>Activities/Risk Sources</b>	» Positioning of all the facilities components.
<b>Mitigation: Target/Objective</b>	» The design of the facility responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as practical, thereby mitigating potential impacts.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Plan and conduct pre-construction activities in an environmentally acceptable manner	Developer	Design phase
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, flora, aquatic ecology (i.e. pans), avifauna, and heritage, as detailed within the EIA report and relevant appendices.	Engineering Design Consultant / Developer	Tender Design & Design Review Stage
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	Contractor	Design phase
A comprehensive stormwater management plan must be compiled that details how storm-water will be managed to reduce velocities and volumes of water that could lead to erosion of surfaces.	Developer	Design phase
A detailed geotechnical investigation is required for the design phase. This should be undertaken with due regard for all environmental legislative requirements.	Developer	Design phase
Submit a final layout to DEA prior to the commencement of construction. This layout should provide information on all components of the project.	Developer	Pre-construction
Obtain all relevant permits (e.g. protected plants and trees) prior to construction in an area.	Developer	Pre-construction
Removal of trees used by White-browed Sparrowweavers for breeding must be avoided.	Contractor / ECO	Design and construction phase
A traffic management plan must be prepared for site access roads to minimise or where possible avoid the hazards which could result from increased traffic and to ensure that traffic flow is not adversely affected. This document would be a working document to be updated as and when required.	Contractor	Pre-construction

<b>Performance Indicator</b>	» The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the EIA Report.
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<b>Monitoring</b>	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.
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**OBJECTIVE PD2: The mitigation and possible negation of visual impacts associated with the planning of the Proposed Bosjesmansberg PV East Solar Energy Facility.**

The following issues identified from a visual perspective should be considered during the planning phase:

- » The visibility of the facility to and potential visual impact on observers travelling along roads (specifically the R357) in close proximity to the proposed facility and within the region.
- » The visibility of the facility to, and potential visual impact on observers residing at homesteads (farm residences) and rural settlements located within close proximity of the site and within the region.
- » The potential visual impact of the construction of ancillary infrastructure (i.e. the substation, internal access roads, workshop and offices) on observers in close proximity of the infrastructure on observers in close proximity to the proposed facility.
- » The potential visual impact of operational, safety and security lighting of the facility at night.
- » Potential visual impacts associated with the construction phase on observers in close proximity to the proposed facility.
- » The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place of the region.
- » Potential cumulative visual impacts (or alternately, consolidation of visual impacts) with specific reference to the existing power line infrastructure traversing the development site, the mining activity south of Copperton and other renewable energy projects within close proximity to the proposed SEF.

<b>Project Component/s</b>	Solar energy facility and ancillary infrastructure (i.e. the substation, internal access roads, workshop and office).
<b>Potential Impact</b>	Primary visual impact of the facility due to the presence of ancillary infrastructure as well as the visual impact of lighting at night.
<b>Activity/Risk Source</b>	The viewing of the above mentioned by observers on or near the site (i.e. within 2,5 km of the site) as well as within the region.
<b>Mitigation: Target/Objective</b>	Optimal planning of infrastructure to minimise visual impact.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Retain and maintain natural vegetation in all areas outside of the development footprint.	Developer / design consultant	Early in the planning phase.
Plan the ancillary buildings, roads and other infrastructure in such a way and in such a location that clearing of vegetation is minimised.  Consolidate infrastructure and make use of already disturbed sites rather than pristine areas.	Developer / design consultant	Early in the planning phase.
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the facility and the ancillary infrastructure. The following is recommended:  <ul style="list-style-type: none"> <li>» Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);</li> <li>» Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;</li> <li>» Making use of minimum lumen or wattage in fixtures;</li> <li>» Making use of down-lighters, or shielded fixtures;</li> <li>» Making use of Low Pressure Sodium lighting or other types of low impact lighting.</li> <li>» Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.</li> </ul>	Developer / design consultant	Early in the planning phase.
<b>Performance Indicator</b>	No ancillary infrastructure is apparent from surrounding areas and lighting impact is minimal.	
<b>Monitoring</b>	Not applicable.	

**OBJECTIVE PD3 : Ensure the selection of the best environmental option for the alignment of development areas, laydown areas and access roads**

**Listed plant species:** Two red data-listed plant species are known from the area, *Hoodia gordonii* and *Salsola apiciflora*. Protected species observed within the greater farm portion include *Harpagophytum procumbens*, *Hoodia gordonii*, *Hoodia flava* and *Titanopsis calcarea*, *Pachypodium succulentum*, *Mestoklema tuberosum*, *Aloe claviflora* and *Avonia ustulata*. No protected species were particularly abundant within the proposed development areas and it is highly unlikely that the development of the site would significantly impact the local populations of the any of the listed species.

A preconstruction walk-through of the facility is recommended in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DAFF permitting requirements.

**Archaeological material:** The identified heritage sites must be avoided and included as no-go areas and demarcated.

Opportunities to mitigate the negative impacts of large-scale PV developments largely arise during the Pre-Construction (Planning & Design) stage. The correct choice of footprint location and layout is paramount, thus ecosystem components such as biodiversity and ecosystem function should be given full consideration during the design phase, as determined by the Environmental Impact Assessment. The design of PV arrays (panel size, height, spacing, and nature of panels – tracking or fixed) can be equally important. The timing of pre-commencement, construction, maintenance and decommissioning activities also provides opportunities to reduce negative impacts on biodiversity.

Once the final layout has been designed, a detailed investigation of the footprint area, during the optimal growing season and as described below must be conducted before activities commence.

<b>Project Component/s</b>	<ul style="list-style-type: none"><li>» PV Array</li><li>» Grid connection and associated servitudes</li><li>» Access roads</li><li>» Workshop, guardhouses, substation and other related infrastructure</li><li>» Temporary construction camps</li><li>» Protective fencing around development</li><li>» Potential topsoil stockpiles and/or borrow pits</li></ul>
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<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Placement that damages and degrades the environment unnecessarily, particularly with respect to habitat destruction, loss of indigenous flora, damage to rocky niche habitats, establishment, and persistence of alien invasive plants, and erosion.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Positioning of solar components and internal access routes</li> <li>» Positioning of workshop, guardhouses, substation and other related infrastructure</li> <li>» Alignment of power lines and servitudes</li> <li>» Alignment of access roads to development</li> <li>» Positioning of temporary sites</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure selection of best environmental option for positioning alignment of proposed infrastructure</li> <li>» Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Avoid: <ul style="list-style-type: none"> <li>» All vegetation in and around natural pans, with a recommended buffer of 100 m from the pan edges</li> <li>» Dense patches of protected / listed plant species</li> <li>» Rocky hills</li> <li>» Heritage sites identified</li> </ul>	Developer	Design phase
Undertake pre-construction walk-through survey for the final development footprint for protected flora.  The final footprint investigation (walkthrough) is aimed to fully inform the developer, responsible conservation authority (that will issue the relevant destruction permits), contractors, EO and ECO regarding: <ul style="list-style-type: none"> <li>» Protected and red data species that will be affected by the development</li> <li>» Location of protected plant species within the footprint area – either individually mapped or approximate areas of occurrence, especially dense patches (alternatively, for linear structures, between which structures or other markers)</li> <li>» Identification of the affected species by providing a representative photo record that enables EO/ECOs and contractors to identify such plants</li> <li>» How many specimens per species may be affected – estimate based on random transect surveys</li> <li>» Which species can be successfully relocated, which and how many will have to be destroyed</li> <li>» Location and nature of any nesting sites or active</li> </ul>	Developer, carried out by Specialist	Design review phase

Mitigation: Action/Control	Responsibility	Timeframe
<p>burrows of vertebrate species (birds, amphibians, reptiles and mammals), that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed person(s)</p> <ul style="list-style-type: none"> <li>» Approximate location and nature of any alien invasive species that will have to be cleared by the contractor</li> <li>» Location and nature of any other significant environmental concerns, e.g. extreme gully erosion, that will need to be addressed by the contractor to prevent any unnecessary (further) degradation of the development footprint</li> </ul>		
<p>The above pre-construction surveys must be used together with results from the ecological specialist report to draft the following:</p> <ul style="list-style-type: none"> <li>» A comprehensive search and rescue program for plants</li> <li>» A comprehensive alien invasive species eradication and management plan</li> </ul>	Developer, carried out by Specialist	Design review phase
Obtain permits for protected plant removal and relocation prior to commencement of any activity related to this development	Developer, or contractor responsible for vegetation clearing	Pre-commencement
Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the EIA Report	Developer	Prior to submission of final construction layout plan
Utilise existing roads as far as possible. Where new access roads must be implemented, plan these and machinery turning points to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of topsoil, prevent obstruction or alteration of natural water flow	Developer	Design phase
Compile a comprehensive stormwater management and erosion control plan for the footprint area as part of the final design of the project	Developer and relevant specialist	Design phase
<p>Permissible biodiversity:</p> <ul style="list-style-type: none"> <li>» Depending on the final PV array and mechanism developed and taking all potential impacts, fire risks and maintenance requirements into consideration, it has to be decided upon and made clear: <ul style="list-style-type: none"> <li>○ Permissible vegetation: maximum height,</li> </ul> </li> </ul>	Developer, in consultation with relevant specialist	Design phase

Mitigation: Action/Control	Responsibility	Timeframe
desirable density and composition <ul style="list-style-type: none"> <li>○ Maintenance of this vegetation – mowing, small livestock grazing</li> <li>○ Permissible terrestrial fauna that could be allowed to migrate/return to the area below/between the PV arrays – including species that must be excluded due to potential damage to the development</li> </ul>		
After the permissible biodiversity has been determined, compile a comprehensive vegetation and habitat rehabilitation management plan.	Developer and relevant specialist	Design phase
Depending on the type of PV panels selected for the development, a plan must be put in place to deal with accidental breakages and potential release of harmful substances. This plan must include as a minimum: <ul style="list-style-type: none"> <li>» How and where broken components can be disposed of</li> <li>» if any material can be recycled, and where materials must then be taken for recycling</li> <li>» Actions to be incorporated into the waste management plan</li> </ul>	Developer and relevant waste management specialist	Design phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Solar components and all associated temporary and permanent infrastructure and access road alignments meet environmental objectives</li> <li>» Grid connection and road alignments meet environmental objectives.</li> <li>» Ecosystem fragmentation is kept to a minimum</li> <li>» Ecosystem functionality is retained and any degradation prevented</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and the ECO prior to the commencement of activity.</li> </ul>

#### OBJECTIVE PD4: Search and Rescue of All Translocatable Indigenous Plants

Prior to commencement of any activity, including earthworks (grading, road construction) within areas of natural vegetation a plant Search and Rescue program should be developed and implemented, preceded by a meticulous investigation of all footprint areas by a suitably qualified botanist, conducted during the optimal growing season along the entire footprint area.

The section below provides a guideline for the Search & Rescue Plan on site and will need to be supplemented with the relevant methodology depending on the final placement of infrastructure.

<b>Project Component/s</b>	» Any infrastructure or activity that will result in disturbance to natural areas.
<b>Potential Impact</b>	» Substantially increased loss of natural vegetation at construction phase and waste of on-site plant resources, and lack of locally sourced material for rehabilitation of disturbed areas. » Increased cost of having to buy in material for rehabilitation.
<b>Activities/Risk Sources</b>	» Construction related loss and damage to remaining natural vegetation via heavy machinery, .
<b>Mitigation: Target/Objective</b>	» Rescue, maintenance and subsequent replanting of at least 40% of the natural vegetation in all development footprints within any areas of natural vegetation on site

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Conduct a preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DAFF permitting requirements.	ECO and horticultural Contractor	Prior to construction
Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.	ECO and horticultural Contractor	Prior to construction
Provide supervision and oversight of vegetation clearing activities within sensitive areas.	ECO and horticultural Contractor	Construction
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. Within the PV areas, the ground layer should be left intact if possible to minimise biodiversity loss as well as protect the soil from erosion.	ECO and horticultural Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed.	ECO and horticultural Contractor	Construction
Temporary lay-down areas should be located within the development footprint or within areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	ECO and horticultural Contractor	Construction
Rescue and replanting to be undertaken in accordance with relevant permits.	ECO and horticultural Contractor	Prior to construction



<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Horticulturist to submit list of target species to botanist for approval.</li> <li>» Rescue of material.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» ECO to monitor Search and Rescue.</li> <li>» Horticulturist to liaise with botanist.</li> <li>» Botanist to review rehabilitation success after 3 months of replanting of rehabilitation areas.</li> </ul>

**OBJECTIVE PD5: To ensure effective communication mechanisms**

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

<b>Project component/s</b>	» Solar energy facility
<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 solar energy facility construction</li> <li>» Activities associated with solar energy facility operation</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Effective communication with affected and surrounding landowners</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 (as outlined in Appendix A) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues. This procedure should be in line with the South African Labour Law.	Developer	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaison with landowner is to be undertaken prior to the commencement of construction in order to provide sufficient time for him to plan agricultural activities.	Developer / Contractor	Pre-construction

<b>Performance Indicator</b>	» Effective communication procedures in place.
<b>Monitoring</b>	» An incident reporting system should be used to record non-conformances to the EMPr.

**MANAGEMENT PROGRAMME: CONSTRUCTION**

**CHAPTER 7**

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

- » Ensures that construction activities are properly 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 any remaining indigenous natural vegetation and habitats of ecological value (i.e. drainage lines).
- » Minimises impacts on fauna using the site.
- » Minimises the impact on heritage site should they be uncovered.

**6.1 Objectives**

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

**OBJECTIVE C1: Securing the site and site establishment**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Area infrastructure (i.e. PV panels, and substation).</li> <li>» Linear infrastructure (i.e. power line, and access roads).</li> <li>» Laydown areas and site camps</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Hazards to landowners and public.</li> <li>» Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located.</li> <li>» Loss of threatened plant species</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Open excavations (foundations and cable trenches).</li> <li>» Movement of construction vehicles in the area and on-site.</li> <li>» Site clearance and levelling activities.</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> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Secure site, working areas and excavations in an appropriate manner, as agreed with the Environmental Officer.	Contractor	Erection: during site establishment

Mitigation: Action/Control	Responsibility	Timeframe
		Maintenance: for duration of Contract
Where necessary to control access, fence and secure area (especially relevant to no-go areas).	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Contractors and construction workers must be informed of the no-go areas.	Developer	Construction
Fence and secure Contractor's equipment camp.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Perimeter fencing around the broader site/ farm portions for the solar energy facility ((which is clearly indicated with flags to be implemented. All deep excavations must be adequately protected. There is to be no unauthorised disturbance outside the demarcated development footprint. Any activities outside the development footprint to be authorised by the Owner's Representative.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English and any other relevant locally spoken languages, all to the approval of the Site Manager.	Contractor	Erection: during site establishment Maintenance: for duration of Contract

<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 facilities provided at construction site.</li> <li>» No disturbance of vegetation outside of development footprint.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» An incident reporting system will be used to record non-conformances to the EMPr.</li> <li>» 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> </ul>

## OBJECTIVE C2: Environmentally Sensitive Location Of Temporary Construction Equipment Camps On Site

The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. Construction equipment and materials may need to be stored at an appropriate location on the site for the duration of the construction period. There are designated areas as shown on the layout plan. Deviations from this should be agreed with the ECO prior to these being implemented.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Construction equipment camps (temporary)</li> <li>» Facilities for storing, mixing and general handling of materials</li> <li>» Access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Damage to and loss of indigenous biodiversity;</li> <li>» Damage to and/or loss of topsoil;</li> <li>» Initiation of accelerated erosion;</li> <li>» Compacting of ground;</li> <li>» Pollution of the surrounding environment due to inadequate or inappropriate facilities; and</li> <li>» Impacts on landowners</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Vegetation clearing and levelling of equipment storage area/s; and</li> <li>» Access to and from the equipment storage area/s.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise impacts on the social and biophysical environment; and</li> <li>» To limit equipment storage to within the demarcated site.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The location of the construction equipment camp will take cognisance of any ecologically and heritage sensitive areas identified. The final location of this construction equipment camp shall be approved by the project ECO.	Contractor	Pre-construction
No temporary site camps will be allowed outside the footprint of the development area.	Contractor	Contract duration
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Erection: Site establishment Maintenance: contract duration
Prepare sites in line with other mitigation measures	Contractor, in	Contract duration

Mitigation: Action/Control	Responsibility	Timeframe
outlined to minimise damage to environment and biodiversity. After demarcation, the site may not be cleared without the inspection of mitigation measures undertaken and approval of the ECO	consultation with ECO	
Rehabilitate and re-vegetate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No visible erosion scars once construction in an area is completed.</li> <li>» No claims regarding damage due to unauthorised removal of vegetation or loss of fauna.</li> <li>» All damaged areas successfully rehabilitated one year after completion.</li> <li>» No damage to drainage lines and/or pan areas.</li> <li>» Appropriate waste management and zero pollution.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular audits of the construction camps and areas of construction on site.</li> <li>» A photographic record must be established before, during and after mitigation.</li> <li>» An incident reporting system should be used to record non-conformances to the EMPr.</li> </ul>

**OBJECTIVE C2: Minimise loss and disturbance to mammals, reptiles and amphibians**

Prior to any earthworks (including road construction) in a demarcated area, The ECO needs to inspect the area and supervise the removal and relocation of any individual of mammal, reptile or amphibian that may be on the site, either in burrows or just traversing the area.

Fences and roads must be constructed in such a way that they do not prevent the natural migration of small mammals, reptiles, or amphibians.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV Array</li> <li>» Grid connection and associated servitudes</li> <li>» Access roads and fences</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Loss of habitat and natural resources to small mammals, reptiles and amphibians</li> <li>» Associated decline of populations of above fauna</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Permanent obstruction of natural migration routes</li> </ul>
<b>Mitigation:</b>	<ul style="list-style-type: none"> <li>» Creation of safe passage across roads or passages through</li> </ul>

**Target/Objective** fences

Mitigation: Action/Control	Responsibility	Timeframe
If the facility is to be fenced, then the fence should not be of a design which excludes the movement of moderate sized fauna through the facility. As such fine mesh fencing would be undesirable and palisade or horizontal strand fencing would be preferable.	Contractor Specialist	Prior to and during construction
Fauna within the site which do not pose a danger to humans or the operation of the facility should be tolerated.		
Ensure that off-road impact by heavy machinery is restricted to designated areas only and only previously disturbed sites or designated laydown areas are used for storing and handling materials and machinery	Contractor	Prior to and during construction
It would be advisable and desirable to create several migration openings at regular intervals at the base of fences (i.e. holes of a diameter of about 30 - 50 cm with a reinforced edge from poles or tyre-edges). This is to allow small mammals to freely move through the fences without damaging fences by digging or standing the risk of getting trapped in partially damaged fences, whilst minimising the effect of habitat fragmentation on smaller vertebrates that would be most affected by habitat fragmentation.	Contractor	Prior to and during construction
Fences must be regularly checked, especially during construction, for illegally set snares and such reported to the ECO and/or site manager and removed immediately	Contractor / ECO	Prior to and during construction
After decommissioning, remove all foreign material and rip area to facilitate the establishment of vegetation and implement a suitable rehabilitation plan of the area	Contractor	Prior to and during construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No animal death caused by construction activities</li> <li>» No illegal snaring of fauna</li> <li>» Continued safe movement of small fauna across the largest portions of the proposed development, except within areas where the type of infrastructure or use thereof may be dangerous to the animals</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» ECO to monitor and keep record of animal deaths on site and report any incidences to management for immediate remedial action</li> <li>» Continued monitoring of fence lines and other infrastructure to ensure they pose no danger to small fauna and implement mitigation measures if fauna deaths are detected</li> </ul>

**OBJECTIVE C3: Minimise impact on sensitive avifauna**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV Array</li> <li>» Grid connection and associated servitudes</li> <li>» Access roads and fences</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Loss of sensitive habitat to local avifauna</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Construction of PV arrays</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Restricting the construction footprint to a bare minimum</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Avoiding construction in areas of natural vegetation and where remnant patches are present and that may be classified as sensitive vegetation types (refer to the botanical impact assessment for details of sensitivity). Removal of trees used by White-browed Sparrow-weavers for breeding must be avoided.	Contractor, EO, ECO	Extent of contract
Limiting disturbance as much as possible during the breeding season to minimize impacts on breeding productivity and displacement of birds.	Contractor, EO, ECO	Extent of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Observe a 1km buffer around colonies of sensitive species (White-browed Sparrow-weaver).</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» EO/ECO to report monthly on construction progress and, in the absence of a 'during construction bird monitoring programme', make 'ad-hoc' observations on the displacement of birds from the construction footprint of the site, including all access roads to be used by construction vehicles. Observations relating specifically to birds that tend to habituate to the construction disturbance should be noted, recorded and any priority bird species that show clear displacement. The bird list compiled during the EIA process for the facility should be used as the basis by the EO/ECO.</li> </ul>



**OBJECTIVE C4: Ensure prevention of erosion through effective run-off control**

Impacts to grazing practices are anticipated to be minimal as grazing is undertaken over the greater farm portion as well as adjacent farms owned by the landowner. Notwithstanding, the construction area should remain safe for the passage of livestock to other areas of the farm and erosion as a result of construction practices should be managed and addressed.

<b>Project components</b>	All project components that change the surface can alter surface run-off characteristics.
<b>Potential Impact</b>	Erosion will cause loss and degradation of soil resources.
<b>Activity / risk source</b>	All activities on site will can alter surface run-off characteristics.
<b>Mitigation: Target / Objective</b>	To have no erosion on and downstream of the site as a result of run-off from the site.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Construct an effective run-off control system to collect and safely disseminate water where necessary from surfaces during all phases of the project, without causing downstream erosion. The system will need to adapt to changing conditions through the construction phase into the operational phase.	Contractor and ECO	Project life time
Construct an effective run-off control system to collect and safely disseminate water where necessary from surfaces during all phases of the project, without causing downstream erosion. The system will need to adapt to changing conditions through the construction phase into the operational phase.	Contractor and ECO	Project life time

<b>Performance Indicator</b>	That no erosion occurs on or downstream of the site as a result of run-off from the site.
<b>Monitoring</b>	Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.

**OBJECTIVE C5: Ensure effective topsoil covering to conserve soil fertility on all disturbed areas.**

Topsoil must at all times be treated as a valuable natural resource, and may thus not be discarded or degraded. Soils are largely shallow to non-existent, with calcrete present in most areas of the farm.

<b>Project components</b>	All constructional activities that disturb the soil below surface, such as levelling, excavations etc.
<b>Potential Impact</b>	Lack of topsoil, resulting in significant decrease in soil fertility.
<b>Activity / risk source</b>	All constructional activities that disturb the soil below surface, such as levelling, excavations etc.
<b>Mitigation: Target / Objective</b>	Ensure effective topsoil covering on all disturbed areas.

<b>Mitigation: Action / control</b>	<b>Responsibility</b>	<b>Timeframe</b>
If an activity will mechanically disturb below surface in any way, then the upper 10-30 cm of topsoil (depending on the specific topsoil depth at the site of disturbance) should first be stripped from the entire disturbed surface and stockpiled for re-spreading during rehabilitation.	Contractor and ECO	Duration of the construction phase
Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.	Contractor and ECO	Duration of the construction phase
Dispose of all subsurface spoils from excavations where they will not impact on agricultural land (for example on road surfaces) or where they can be effectively covered with topsoil.	Contractor and ECO	Duration of the construction phase
The stockpiled topsoil must be evenly spread over the entire disturbed surface.	Contractor and ECO	During rehabilitation after construction / operation.

<b>Performance Indicator</b>	That no disturbed areas are left without an effective covering of topsoil, and potential for re-vegetation, after rehabilitation.
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.</li> <li>» Record the GPS coordinates of each area.</li> </ul>

	<ul style="list-style-type: none"> <li>» Record the date of topsoil stripping.</li> <li>» Record the GPS coordinates of where the topsoil is stockpiled.</li> <li>» Record the date of cessation of constructional (or operational) activities at the particular site.</li> <li>» Photograph the area on cessation of constructional activities.</li> <li>» Record date and depth of re-spreading of topsoil.</li> <li>» Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</li> </ul>
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Management of erosion will be required during the construction phase of the facility. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management plan included in Appendix C.

**OBJECTIVE C6: Conserve surrounding natural veld vegetation**

<b>Project components</b>	All activities involving vehicular traffic.
<b>Potential Impact</b>	Trampling of vegetation by vehicles will cause degradation of veld.
<b>Activity / risk source</b>	Any traffic off roads on in-tact veld.
<b>Mitigation: Target / Objective</b>	To have no vehicular trampling of in-tact veld.

Mitigation: Action / control	Responsibility	Timeframe
Prohibit vehicular passage off designated roads.	Contractor, EO, ECO	Project life time

<b>Performance Indicator</b>	That no vehicular trampling of in-tact veld occurs on site.
<b>Monitoring</b>	Include periodical site inspection in environmental performance reporting that specifically records occurrence or not of off-road vehicle tracks in specific areas. Periodical inspections should be more frequent during construction phase.

**OBJECTIVE C7: Manage and reduce the impact of invasive vegetation**

Although alien plant abundance at the site is relatively low, a number of alien species were observed within disturbed areas and within the open veld and the disturbance generated at the site during the construction phase would be sure to encourage the invasion of the disturbed areas by alien species. Active control measures are likely to be required to combat this problem during the first few years of the operational phase. Due to the disturbance at the site during decommissioning, alien plant species are likely to invade the site and a long-term control plan will need to be implemented for several years after decommissioning

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV Array</li> <li>» Grid connection and associated servitudes</li> <li>» Temporary construction camps</li> <li>» Workshops and/or other permanent infrastructure</li> <li>» Access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impacts on natural vegetation.</li> <li>» Impacts on soil.</li> <li>» Impact on faunal habitats.</li> <li>» Loss of agricultural potential.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Transport of construction materials.</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 road.</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To avoid the introduction of additional alien invasive plants to the project control area.</li> <li>» To avoid further distribution and thickening of existing alien plants on the project area.</li> <li>» To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the project control area.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Cleared and disturbed areas should be re-vegetated with a cover of indigenous grass or shrubs.	Contractor	Construction phase
Avoid creating conditions in which invasive 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>» Shred all non-seeding material from cleared</li> </ul>	Contractor	Construction phase

Mitigation: Action/Control	Responsibility	Timeframe
invasive shrubs and other vegetation an use as mulch as part of the rehabilitation and re-vegetation plan » Do not import soil from areas with alien plants		
» Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Contractor	Construction phase
» Immediately control any alien plants that become newly established using registered control measures	Contractor	Construction phase
» Ensure that material from invasive plants that can regenerate – seeds, suckers, plant parts are adequately destroyed and not further distributed	Contractor	Construction phase

<b>Performance Indicator</b>	» Visible reduction of number and cover of alien invasive plants within the project area. » Improvement of vegetation cover from current dominance of invasive shrubs to dominance of perennial grasses and dwarf shrubs » No establishment of additional alien invasive species.
<b>Monitoring</b>	» On-going monitoring of area by ECO during construction. » Ongoing monitoring of area by EO during operation » Audit every two to three years by a suitably qualified botanist to assess the status of infestation and success of eradication measures » If new infestations are noted these must be recorded. A comprehensive eradication programme with the assistance of the WfW Programme is advisable.

**OBJECTIVE C8: Appropriate management of the construction site and construction workers**

It is expected that all construction staff will reside within existing accommodation in nearby urban areas. No staff may be accommodated on site. Construction equipment and machinery may need to be stored at an appropriate location on the site for the duration of the construction period, and temporary staff facilities will have to be made available. However, washing and servicing of vehicles on site is not permitted.

<b>Project Component/s</b>	» Construction equipment camps » Facilities for storing, mixing and general handling of materials » Access roads
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<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Damage to indigenous natural vegetation;</li> <li>» Damage to and/or loss of topsoil;</li> <li>» Initiation of accelerated erosion;</li> <li>» Compacting of ground; and</li> <li>» Pollution of the surrounding environment due to excessive dust, inadequate and/or inappropriate facilities provided or procedures implemented</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Vegetation clearing and levelling of temporary construction or storage area/s;</li> <li>» Transport to and from the temporary construction or storage area/s;</li> <li>» Types of materials or equipment and the manner in which they are stored or handled;</li> <li>» Dust emissions</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise impacts on the biophysical environment</li> <li>» To prevent any residual or cumulative impacts arising from temporary construction or storage areas</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
<ul style="list-style-type: none"> <li>» The location of the construction equipment camp and all access routes must take cognisance of any ecologically sensitive areas identified.</li> <li>» The location of this construction equipment camp shall be approved by the Contractor in consultation with the project ECO or the ecological specialist responsible for the pre-commencement footprint investigation</li> </ul>	Contractor/ECO	Pre-construction
<p>No temporary site camps will be allowed outside the footprint of the development area.</p> <ul style="list-style-type: none"> <li>» To minimise the footprint, temporary storage of equipment and materials on site should be kept at a minimum</li> </ul>	Contractor	Construction
<p>As far as possible, minimise natural and semi-natural vegetation clearing for equipment storage areas.</p> <ul style="list-style-type: none"> <li>» Aim to locate the temporary construction camps on already disturbed areas</li> </ul>	Contractor	During site establishment
<p>Staff must be supplied with adequate facilities aimed at preventing any kind of pollution</p> <ul style="list-style-type: none"> <li>» Cooking on open fires must be prohibited, if staff need cooking/kitchen facilities on site, such should be provided by the contractor</li> </ul>	Contractor	Construction, Operational phase
<p>Identify and demarcate construction areas, servitudes, and access for general construction work and restrict construction activity to these areas.</p> <ul style="list-style-type: none"> <li>» Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling)</li> </ul>	Contractor	Before and during construction, operational phase

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>» Create specific turning points and parking areas for vehicles and heavy machinery as needed</li> <li>» Strictly prohibit any driving outside designated areas and roads</li> <li>» Control dust</li> </ul>		
<p>To limit the possible distribution of undesirable species and possible pollutants onto site:</p> <ul style="list-style-type: none"> <li>» Regularly check clothing and vehicles for mud and seed and clear in an appropriate manner (see invasive plant management for more details)</li> <li>» Do not wash down any machinery or vehicle within the farm portion, including the footprint area</li> <li>» No vehicles shall be serviced on the affected land portion</li> <li>» All materials moved onto the development site must be free of weeds or any other undesirable organisms or pollutants</li> <li>» It is recommended that fuels, lubricants and other chemicals only be stored on site if absolutely necessary, and then in a manner that prevents any accidental spillage</li> </ul>	Contractor	Before and during construction, operational phase
Rehabilitate and revegetate all disturbed areas at the construction equipment camp as soon as construction is complete within an area and mitigate erosion where required as per specific management plans	Contractor, rehabilitation contractor	Construction, operational phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No visible erosion scars or any pollution once construction in an area is completed</li> <li>» All damaged areas successfully rehabilitated one year after completion</li> <li>» No damage to drainage lines or other types of wetland areas</li> <li>» Appropriate waste management</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular monitoring and audits of the construction camps and temporary structures on site by the ECO</li> <li>» A photographic record must be established before, during and after mitigation</li> <li>» An incident reporting system should be used to record non-conformances to the EMPr, followed by the necessary action from the developer to ensure full compliance</li> </ul>

**OBJECTIVE C9: Maximise local employment and business opportunities associated with the construction phase**

Employment opportunities will be created during the construction phase (i.e. ~300 staff at peak periods of construction), specifically for semi-skilled and unskilled workers. The unemployment rate in the study area is noted to be high and there will therefore be individuals in the area in search of employment. 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>	Construction and establishment activities associated with the establishment of the solar energy facility, including infrastructure .
<b>Potential Impact</b>	The opportunities and benefits associated with the creation of local employment and business should be maximised.
<b>Activities/Risk Sources</b>	The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
<b>Mitigation: Target/Objective</b>	Employ local labour as far as possible

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase.	Developer	Where required, training and skills development programmes to be initiated prior to the initiation of the construction phase
Skills audit to be undertaken to determine training and skills development requirements.	Developer	Skills audit to determine need for training and skills development programme undertaken within 1-month of commencement of construction phase commences.
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	Developer	Database of potential local BEE services providers to be completed before
Identify potential opportunities for local	Developer	



Mitigation: Action/Control	Responsibility	Timeframe
businesses.		construction phase commences. Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Employment and business policy document that sets out local employment and targets completed before construction phase commences.</li> <li>» Majority of semi and unskilled labour locally sourced.</li> <li>» Database of potential local BEE services providers in place before construction phase commences.</li> <li>» Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> </ul>

**OBJECTIVE C10: Avoid the potential impacts on family structures and social networks associated with presence of construction workers from outside the area**

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to the potential behaviour of male construction workers, including an increase in alcohol and drug use, an increase in crime levels, the loss of girlfriends and or wives to construction workers, an increase in teenage and unwanted pregnancies, an increase in prostitution and an increase in sexually transmitted diseases.

The potential risk to local family structures and social networks is, however, likely to be low. The low and semi-skilled workers are likely to be local residents and will therefore form part of the local family and social network.

<b>Project Component/s</b>	Construction and establishment activities associated with the establishment of the solar energy facility, including infrastructure.
<b>Potential Impact</b>	The presence of construction workers who live outside the

	area and who are housed in local towns can impact on family structures and social networks.
<b>Activities/Risk Sources</b>	The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.
<b>Mitigation: Target/Objective</b>	To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Low-skilled workers are sourced from the local area. This should be included in the tender documents. Construction workers should be recruited from the local municipal areas as far as possible.	Developer and contractors	Identify suitable local contractors prior to the tender process for the construction phase.
Identify local contractors who are qualified to undertake the required work.	Developer	Pre-construction
Develop and implement a Code of Conduct to cover the activities of the construction workers housed at temporary camps / hostels.	Contractor	Pre-construction
Ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct. Ensure that construction workers attend a briefing session before activities on site commence. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	Contractors	Prior to the commencement of construction
Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	Contractors	Prior to the commencement of construction
Construction workers who are found guilty of breaching the Code of Conduct must follow disciplinary processes in terms of the South African Labour Laws. All dismissals must be in accordance with South African labour legislation.	Contractors	Construction phase
Provide opportunities for workers to travel to their home town at regular intervals or over weekends.	Contractors	Construction phase
Adhere to OHS legal requirements and	Contractors	Construction

Mitigation: Action/Control	Responsibility	Timeframe
measures contained in the EMPr		
Establish and implement OHS procedures for employees on site, including use of Personal Protection Equipment (PPE)	Contractors	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Employment policy and tender documents that sets out local employment and targets completed before construction phase commences.</li> <li>» Majority of semi and unskilled labour locally sourced.</li> <li>» Local construction workers employed have proof that they have lived in the area for five years or longer.</li> <li>» Tender documents for contractors include recommendations for construction camp.</li> <li>» Code of Conduct drafted before commencement of construction phase.</li> <li>» Briefing session with construction workers held at outset of construction phase.</li> </ul>
» Monitoring	» The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

**OBJECTIVE C11: Minimise impacts related to traffic management and transportation of equipment and materials to site (Traffic Management and Transportation Plan)**

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment (including PV panels components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary and external works outside the site boundary.

The section below provides a guideline for the Traffic Management and Transportation Plan on site and will need to be supplemented with the relevant final transport plan devised by the EPC partner during the final design phase of the facility.

<b>Project Component/s</b>	» Delivery of any component required within the construction phase.
<b>Potential Impact</b>	» Impact of heavy construction vehicles on road surfaces, and

	<p>possible increased risk in accidents involving people and animals.</p> <ul style="list-style-type: none"> <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> <li>» Foundations or plant equipment installation.</li> <li>» Transportation of ready-mix concrete from off-site batching plant to the site.</li> <li>» Mobile construction equipment movement on-site.</li> <li>» Power line and substation construction activities.</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 volume, 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>
The contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the commencement of construction activities on site.	Developer	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	Developer and Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	Developer	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Developer	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways. Signage must be appropriately maintained and placed in areas visible to all road users.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards). Signage must be appropriately maintained and placed in areas visible to all road users.	Contractor	Duration of contract
Appropriate maintenance of all vehicles must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions and other standard traffic control information.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Vehicles keeping to the defined speed limits within the site and on public roads.</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 ECO must monitor indicators listed above to ensure that they have been implemented.</li> </ul>

**OBJECTIVE C12: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure**

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to “outsiders” being in the area to undertake their criminal activities.

<b>Project Component/s</b>	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure .
<b>Potential Impact</b>	» Impact on safety of farmers and communities (increased crime) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
<b>Activities/Risk Sources</b>	» The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential impact on local communities and their livelihoods.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Inform all workers of the conditions contained in the Code of Conduct.	Contractor	Pre-construction
Dismiss all workers that do not adhere to the code of conduct for workers. All dismissals must be in accordance with South African labour legislation	Contractor	Construction
Compensate farmers / community members at full market related replacement cost for <i>proven</i> losses resulting from contractors on the site, which may include livestock loss, damage to infrastructure .	Contractors	Construction phase
Develop & Implement a Health & Safety Plan. Train staff on the H&S Plan	Developer & Contractor	Construction & Operations

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Code of Conduct developed and approved by the developer prior to commencement of construction phase.</li> <li>» All construction workers made aware of Code of Conduct within first week of being employed.</li> <li>» Compensation claims settled within 1 month of claim being verified by the relevant authority or Community MF.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» The proponent and or appointed ECO must report on the indicators listed above to ensure that they have been met for the construction phase.</li> </ul>

### OBJECTIVE C13: Management of dust, vehicle emissions and damage to roads

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>	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure
<b>Potential Impact</b>	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
<b>Activities/Risk Sources</b>	» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and minimise damage to roads.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Maintain communication with Free State Provincial Roads authority regarding their requirements for measures to be instituted regarding use of and impacts on the R357 road.	Developer and Contractor	Duration of Construction
Implement appropriate dust suppression measures for heavy vehicles: <ul style="list-style-type: none"> <li>» wetting roads on a regular basis</li> <li>» ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.</li> </ul>	Contractors	Duration of Construction
Ensure that all vehicles are road-worthy; drivers are qualified and are made aware of the potential noise, dust and safety issues.	Contractors	Duration of Construction

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that drivers adhere to defined speed limits within the site and on public roads. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractors	Duration of Construction
Ensure that damage to roads attributable to construction activities associated with the PV facility is repaired before completion of construction phase.	Contractors	Duration of Construction
Clearly demarcate construction areas	Contractors	Duration of Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>• Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences.</li> <li>• Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> <li>» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase</li> </ul>

**OBJECTIVE C14: Limit impacts on heritage resources**

Stone Age material is found widespread across the greater farm but is mostly of low heritage significance. Some sites however are of higher significance and some mitigation are recommended for these sites. Three heritage sites were identified on the site which require *in-situ* preservation as per the recommendations of the heritage specialist:

- » Site 1 (013 in Figure 1.4 below) consists of a pan located in the north eastern portion of PV East. To the east of the pan is fairly deep Aeolian sand and artefact counts in this area drop drastically. Most of the artefacts in this area consist of Middle Stone Age (MSA) flakes and blades with dorsal and lateral retouch, some pieces show signs of being utilised. All the MSA are on the locally available quartzite. The site falls within a large cluster of a high density artefacts indicated as a heritage sensitive area (Figure 8) Artefact ratio around the pan varies but the highest frequency is found on the eastern and southern side of the pan (>5 per m<sup>2</sup>). The pan is flagged as a no-go area.

S29° 51 26.7 ; E22° 30 24.8



- » Site 2 and 3 (035 and 036 in Figure 1.4 below) - Both sites form part of the demarcated sensitive area in PV East. Site 2 consists of a high density of artefacts (6-10 per m<sup>2</sup>) mostly MSA. Artefacts consist of unretouched flakes, blades, radial cores made mainly on the locally available quartzite. Site 3 consists of a blue-grey quartzite outcrop that is fairly low standing, approximately 30 cm above the surface, with some evidence of flake scarring. This may suggest a source for knapping material. Several MSA flakes and possibly some ESA flakes are found scattered around the area with an artefact density of > 5 per m<sup>2</sup>. The area is characterised by hard packed Aeolian sands on top of calcrete and possible extend over 100m<sup>2</sup>.

S29° 51 32.8 ; E22° 30 34.9  
 S29° 51 38.1 ; E22° 30 32.5

<b>Project component/s</b>	PV array, access roads and other linear components, substation, laydown areas, any spatial extension of other components addressed in the EIA.
<b>Potential Impact</b>	The potential impact if this objective is not met is that further destruction, damage, excavation, alteration, removal or collection of heritage objects from their current context on the site may result.
<b>Activity/risk source</b>	Activities which could impact on achieving this objective include deviation from the planned lay-out of infrastructure without taking heritage impacts into consideration.
<b>Mitigation: Target/Objective</b>	Mitigation measures as recommended, namely exclusion of the western-most part of the proposed development

Mitigation: Action/control	Responsibility	Timeframe
Demarcate and exclude heritage sites from the development footprint. Prepare a heritage management plan for these sites.	Developer, Heritage specialist, Contractor, ECO	Pre-construction and construction
Preconstruction recording and collection of artefacts in the heritage sensitive areas of the site is required.	Developer, Heritage specialist, Contractor, ECO	Pre-construction
Should archaeological sites, graves or fossils be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner such that an investigation and evaluation of the finds can be made.	Environmental management provider with on-going monitoring role set up by the developer.	Environmental management plan to be in place before commencement of development.
If required, measures must be put in place to prevent vandalism of any archaeological	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
heritage.		
The EO must be trained in basic archaeological site identification in order to immediately inform the archaeologist of any chance discovery of archaeological sites or burials. The archaeologist will then implement the required legal steps in terms of the applicable section of the NHRA.	Contractor Specialist	Construction
The Contractor shall make provision for accidental discovery of archaeological sites and graves on the construction site. In the event that any sites found are significant enough to warrant conservation, the Contractor shall ensure that the requirements of SAHRA are fulfilled.	Contractor	Construction
The Contractor shall also prepare the necessary documentation and obtain the permits from the SAHRA to construct through a site which is directly affected by the construction works but is considered to be of low significance. It should be noted that buildings 60 years and older must be assessed and a permit obtained from SAHRA before demolition is considered.	Contractor	Construction

<b>Performance Indicator</b>	Preservation of identified heritage sites managed in accordance with a heritage management plan
<b>Monitoring</b>	Completed mitigation as recommended including demarcation of possible no-go area/s in the vicinity of the proposed development

**OBJECTIVE C15: The mitigation and possible negation of visual impacts associated with the construction of the Proposed Bosjesmansberg PV East Solar Energy Facility.**

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-

suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

<b>Project Component/s</b>	Construction site, various buildings, a substation, a fence and internal access roads.
<b>Potential Impact</b>	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.
<b>Activity/Risk Source</b>	The viewing of the above mentioned by observers on or near the site (i.e. within 2,5km of the site).
<b>Mitigation: Target/Objective</b>	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Developer / contractor, ECO	Early in the construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Developer / contractor, ECO	Early in the construction phase.
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Developer / contractor, ECO	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Developer / contractor, ECO	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Developer / contractor, ECO	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Developer / contractor, ECO	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Developer / contractor, ECO	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. Consult an ecologist to	Developer / contractor, ECO	Throughout and at the end of the construction phase.

	give input into rehabilitation specifications.
<b>Performance Indicator</b>	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.
<b>Monitoring</b>	Monitoring of vegetation clearing during construction (by contractor as part of construction contract). Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

### OBJECTIVE C16: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the solar energy facility will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage). 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 following Regulations, Norms & Standards dated 23 August 2013 must be observed in the preparation of such guidelines:

- » R634 Waste Classification & Management Regulations
- » R635 National Norms & Standards for the Assessment of Waste for Landfill Disposal
- » R636 National Norms & Standards for Disposal of Waste to Landfill

A guideline for integrated management of construction waste is included as Appendix D and a generic waste management plan is included as Appendix F.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Power line.</li> <li>» Ancillary buildings.</li> <li>» Access roads.</li> <li>» Construction workers camp</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>» Storage of waste oil / hydrocarbons.</li> <li>» Spoil material from excavation, earthworks, and site preparation.</li> </ul>

<b>Mitigation:</b>	» To comply with waste management legislation.
<b>Target/Objective</b>	» To minimise production of waste.
	» To ensure appropriate waste storage and disposal.
	» To avoid environmental harm from waste disposal.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ensure that sanitation facilities are managed to an acceptable standard and used appropriately so as not to pose a health and environmental hazard	Contractor	Duration of contract
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Untamated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Hydrocarbon and other hazardous waste must be contained and stored in sealed containers within an appropriately bunded area.	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
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
Regularly serviced chemical toilets facilities must be used to ensure appropriate control of sewage. A waste	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
manifest should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.		
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.	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

<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>» 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 reporting system will be used to record non-conformances to the EMPr.</li> </ul>

### OBJECTIVE C17: Appropriate handling and storage of chemicals, hazardous substances

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

<b>Project Component/s</b>	» Storage and handling of chemicals, hazardous substances.
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Release of contaminated water from contact with chemicals or hazardous substances.</li> <li>» Generation of contaminated wastes from used chemical or</li> </ul>

	hazardous substances containers.
<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 use and storage.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the storage and handling of chemicals, hazardous substances 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> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Pre-construction and implement for duration of Contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes halting further contamination, cleaning up the affected environment as much as practically possible and implementing preventive measures.	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
Cement dust, slurry from cement batching, or spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place outside of designated areas on-site (except in the case of emergency). Where repairs of vehicles take place, an appropriate sealed surface and/or drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface. The bunded area must be provided with a tap-off system through which spillages and leakages that might occur will be removed without any spillage outside the bunded area.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to	Contractor	Duration of

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
ensure bund stability, integrity, and function.		contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substations must be removed from site by licensed contractors.	Contractor	Duration of contract
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
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Duration of contract
Spilled concrete will be allowed to dry and removed as soon as possible. Hardened concrete can either be recycled at a crushing facility or batching plant, disposed of as spoil, or be disposed of at a general waste landfill site as waste. This excludes dry cement powder.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No chemical spills outside of designated storage areas.</li> <li>» No unattended water or soil contamination by 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>» Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances.</li> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase.</li> <li>» A complaints register must be maintained, in which any complaints from the community will be logged.</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr.</li> </ul>





**OBJECTIVE C18 : To avoid and/or minimise the potential risk of increased veld fires during the construction phase**

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

<b>Project Component/s</b>	» Construction and establishment activities associated with the establishment of PV facility, including infrastructure .
<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.
<b>Activities/Risk Sources</b>	» The presence of construction workers 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>
No cooking and no open fires allowed on site.	Contractor (and sub-contractor/s)	Duration of contract
Designated smoking areas shall be provided	Contractor (and sub-contractor/s)	Duration of contract
Provide adequate fire fighting equipment onsite.	Developer and contractors	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractors	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure attributable to the construction activities.	Contractors	Duration of construction
Join the local Fire Protection Agency	Developer	Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Designated areas for fires and smoking identified on site at the outset of the construction phase.</li> <li>» Fire fighting equipment and training provided before the construction phase commences.</li> <li>» Proven compensation claims resolved and settled.</li> </ul>
<b>Monitoring</b>	» The developer and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

**OBJECTIVE C19: Effective management of concrete batching plants**

Concrete is required during the construction of the solar energy facility. There could be a need to establish a batching plant within the site. Batching plants are facilities/installations that combine various ingredients to form concrete. Some of these inputs include sand, water, aggregate (rocks, gravel), fly ash, potash, and cement.

Turbid and highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. Concrete batching plants, cement, sand and aggregates can produce dust. Potential pollutants in batching plant wastewater and stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

<b>Project component/s</b>	» Batching plant and associated activities
<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> <li>» Spoil material from excavation, earthworks and site preparation</li> </ul>
<b>Mitigation: Target/Objective</b>	» To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Where possible 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
The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant.	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
The concrete batching plant site should demonstrate good maintenance practices, including regular sweeping to prevent dust build-up.	Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a	Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
sheltered position to minimise the effects of the wind.		
Water sprays or a dust suppression agent should be correctly applied to reduce dust emissions from aggregate material.	Contractor	Construction phase
Conveyors must be designed and constructed to prevent fugitive dust emissions. This may include covering the conveyor with a roof, installing side protection barriers and equipping the conveyor with spill trays, which direct material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	Contractor	Construction phase
The site should be designed and constructed such that clean stormwater, including roof runoff, is diverted away from contaminated areas and directed to the stormwater discharge system.	Contractor	Construction phase
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation	Contractor	Construction phase
Contaminated stormwater and process wastewater should be captured and recycled where possible. A wastewater collection and recycling system should be designed to collect contaminated water.	Contractor	Construction phase
Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control	Contractor	Construction phase
Ensure that all practicable steps are taken to minimise the adverse effect that noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms	Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction phase
Empty cement bags should be collected and disposed appropriately.	Contractor	Construction phase

Performance Indicator	<ul style="list-style-type: none"> <li>» No complaints on 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>
Monitoring	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase</li> </ul>

	<ul style="list-style-type: none"> <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>» 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 reporting system will be used to record non-conformances to the EMPr</li> <li>» Developer or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase</li> </ul>
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**OBJECTIVE C20: Management of the Contractors Camp/ Accommodation Facility during construction to avoid negative environmental impacts**

Accommodation for construction workers will be required during the construction phase. The construction camp will also include workshop, ablutions and storage area. The location of the construction camp and accommodation facilities must be reflected in the layout plan.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Construction camp - Housing facilities (including kitchens, canteens, toilets, bedrooms and open spaces)</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Water contamination</li> <li>» Waste generation – potential soil pollution</li> <li>» Noise</li> <li>» Traffic</li> <li>» Safety risks</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Construction workers</li> <li>» Living areas</li> <li>» Noise due to people residing on the site</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Appropriate management of housing facilities</li> <li>» Zero complaints from surrounding landowners/ community/ stakeholders</li> <li>» Zero pollution/ contamination due to construction camp and facilities</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
A Method Statement for the management of the contractors housing facility and camp considering the recommendations below is to be submitted to the ECO for approval.	Contractor and ECO	Prior to the start of construction
Ensure placement of accommodation/ construction camp / hostel away from the resident farmer’s household.	Contractor and ECO	Prior to the start of construction

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ablution facilities shall be provided for use by construction staff residing on site.	Contractor	Construction
Waste bins shall strategically be located around the labour camp for ease of waste management	Contractor	Construction
No littering, burning or burying of waste shall be allowed. The waste should be removed regularly and appropriately disposed of.	Contractor	Construction
Develop a waste management plan for the construction camp.	Contractor	Construction
Excessive noise shall be prohibited at the accommodation facilities.	Contractor	Construction
No open fires shall be permitted out of the designated areas	Contractor	Construction
Safe water for drinking shall be provided at the labour camp	Contractor	Construction
Access to the labour camp shall be limited to labourers residing on site	Contractor	Construction
Designated areas for smoking shall be provided at the labour camp	Contractor	Construction
Due care must be employed in ensuring that water is not wasted at the labour camp	Contractor	Construction
The construction camp used to house equipment an accommodate must be located in a disturbed or low sensitivity area and must be screened off as far as practical during the entire construction phase.	Contractor	Construction
Avoid light pollution due to the construction camp and keep lighting to a minimum.	Contractor	Construction
The location of the construction equipment camp will take cognisance of any ecologically sensitive areas identified. The final location of this construction equipment camp shall be approved by the project ECO and agreed with the landowner.	Contractor	Pre-construction
No temporary site camps will be allowed outside the footprint of the development area.	Contractor	Contract duration
Rehabilitate and revegetate all disturbed areas at the construction equipment camp	Contractor	Duration of Contract

Mitigation: Action/control	Responsibility	Timeframe
as soon as construction is complete within an area.		
<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Appropriate management of housing facilities</li> <li>» No complaints from surrounding landowners/ community/ stakeholders</li> <li>» No pollution/ contamination due to construction camp and facilities</li> </ul>	
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» ECO to monitor the construction camp for duration of construction period</li> </ul>	

## 6.2 Detailing Method Statements

**OBJECTIVE C21: 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 EPC Contractor 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 EPC Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Owner’s Representative and ECO.

The method statements are not written by the ECO since a method statement is a written submission to the ECO and the Owner’s Representative by the EPC Contractor in collaboration with his/her EO.

There are two types of method statements, (1) method statements which carryover throughout the project; which is applicable to all activities and, (2) specific method statements used for one task only. The carryover method statements would be method statements pertaining to (waste management, dust control, cement and concrete batching, top soil management, hydrocarbon and emergency spill procedures, alien and invasive plant control, rehabilitation and plant management, erosion management, storage and management of hazardous substances) the specific method statements are specifically related to one activity. This kind of method statements are drawn up at the beginning of each new task.

The Method Statement must cover applicable details with regard to:

- » Details of the responsible person/s
- » Construction procedures;
- » Materials and equipment to be used;
- » Getting the equipment to and from site;
- » How the equipment/material will be moved while on-site;
- » How and where material will be stored;
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- » Timing and location of activities;
- » Compliance/non-compliance with the Specifications; 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 method statements could include:

- » Construction procedures (for example: site clearing, working within watercourses).
- » Materials and equipment to be used.
- » Transporting the equipment to and from the site.
- » How the equipment will be used while on site.
- » How and where the material will be stored.
- » The containment (or action to be taken if containment is not possible) of the leaks or spillages of any liquid or material that may occur.
- » Timing and location of activities.
- » Compliance/Non compliances with the EMPr specifications and any other information that is deemed necessary.
- » Method Statement for Corrective Actions

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Owner's Representative except in the case of emergency activities and then only with the consent of the Owner's Representative. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Owner's Representative except in the case of emergency activities and then only with the consent of the Owner's Representative. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Once a method statement has been submitted it must be evaluated and checked to ensure that all the activities mentioned on the statement are conducted in a manner which ensures environmental compliance. If all the information on the method statement is correct and compliant, the contractor and the EO must sign the statement. Once all the parties have signed the method statements, copies must be made and submitted to all management parties on site, including the ECO and the EO.

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. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.



### 6.3 Awareness and Competence: Construction Phase of the Solar Energy Facility

**OBJECTIVE C22: 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 Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a PV plant and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
- » The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed 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.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
- » 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.

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:

### **6.3.1 Environmental Awareness Training**

Environmental Awareness Training must take the form of an on-site talk and demonstration by the 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 ECO on site.

### **6.3.2 Induction Training**

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

### **6.3.3 Toolbox Talks**

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

## 6.4 Monitoring Programme: Construction Phase

### **OBJECTIVE C23: 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 Project Manager will ensure that the monitoring is conducted and reported.

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

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

The ECO will ensure compliance with the EMPr, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks. The following reports will be applicable:

#### **6.4.1 Non-Conformance Reports**

All supervisory staff including Foremen, Resident 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. Records of penalties imposed may be required by the relevant authority.

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.

#### ***6.4.2 Monitoring Reports***

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

#### ***6.4.3 Final Audit Report***

A final environmental audit report must be submitted to DEA upon completion of the construction and 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 (as appropriate) and the requirements of the EMPr.

**MANAGEMENT PROGRAMME: REHABILITATION** **CHAPTER 7**

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 R1: 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>	Project components affecting the objective: <ul style="list-style-type: none"> <li>» PV Array supports and trenching</li> <li>» Grid connection and associated servitudes</li> <li>» Access roads</li> <li>» Workshop, guardhouses, substation and other related infrastructure</li> <li>» Potential topsoil stockpiles and/or borrow pits</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Within the footprint, a change of plant species composition with lower productivity and agricultural potential can be expected due to removal, disturbance and continued long-term shading of vegetation</li> <li>» A largely reduced vegetation cover will cause the ecosystem to be more prone to erosion and irreversible degradation</li> <li>» Disturbance of indigenous vegetation creates opportunities for the establishment of invasive vegetation or creation of surfaces that do not support the permanent (re-) establishment of vegetation</li> <li>» Loss of natural regeneration potential of soils</li> <li>» Loss of agricultural potential of soils.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Excavation of foundations and trenches</li> <li>» Construction of site access road</li> <li>» Power line construction activities</li> </ul>

	<ul style="list-style-type: none"> <li>» PV array construction activities</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species</li> <li>» Prevent and accelerated erosion of ecosystem degradation</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
<b>Rehabilitation of surface</b>		
Prior to the application of topsoil <ul style="list-style-type: none"> <li>» subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures</li> <li>» ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper or by hand to a depth of 15 – 20 cm</li> <li>» compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil</li> <li>» any foreign objects, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place</li> <li>» shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes</li> </ul>	Contractor, ECO to control	During and after construction
Application of topsoil <ul style="list-style-type: none"> <li>» topsoils shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed</li> <li>» the final prepared surface shall not be smooth but furrowed to follow the natural contours of the land</li> <li>» the final prepared surface shall be free of any pollution or any kind of contamination</li> <li>» care shall be taken to prevent the compaction of topsoil</li> </ul>	Contractor, ECO to control	During and after construction
Soil stabilisation <ul style="list-style-type: none"> <li>» mulch, if available from shredded vegetation, shall be applied by hand to achieve a layer of uniform thickness</li> <li>» mulch shall be rotovated into the upper 10 cm layer of soil                             <ul style="list-style-type: none"> <li>o this operation shall not be attempted if the wind strength is such as to remove the mulch before it</li> </ul> </li> </ul>	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached

Mitigation: Action/Control	Responsibility	Timeframe
<p>can be incorporated into the topsoil</p> <ul style="list-style-type: none"> <li>» measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible                             <ul style="list-style-type: none"> <li>○ where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed</li> </ul> </li> <li>» additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas</li> <li>» runnels or erosion channels developing shall be back-filled and restored to a proper condition                             <ul style="list-style-type: none"> <li>○ such measures shall be effected immediately before erosion develops at a large scale</li> </ul> </li> <li>» where erosion cannot be remedied with available mulch or rocks, geojute or other geotextiles shall be used to curtail erosion</li> </ul>		
<p>Borrow-pits (if required)</p> <ul style="list-style-type: none"> <li>» shall be shaped to have undulating, low-gradient slopes and surfaces that are rough and irregular, suitable for trapping sediments and facilitation of plant growth</li> <li>» upon completion of rehabilitation these reshaped and revegetated areas shall blend into the natural terrain</li> </ul>	Contractor, ECO to control	After construction
<b>Revegetation</b>		
<ul style="list-style-type: none"> <li>» revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoils could be re-applied within 6 months</li> <li>» revegetation will be done according to an approved planting/landscaping plan according to the desirable end states and permissible vegetation</li> </ul>	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
<p>Re-seeding</p> <ul style="list-style-type: none"> <li>» revegetation can be increased where necessary by hand- seeding indigenous species                             <ul style="list-style-type: none"> <li>○ previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools</li> <li>○ commercially available seed of grass species naturally occurring on site can be used as alternative</li> </ul> </li> <li>» re-seeding shall occur at the recommended time to take advantage of the growing season</li> </ul>	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>» in the absence of sufficient follow-up rains after seeds started germinating, irrigation of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seed bank</li> </ul>		
<p>Planting of species</p> <ul style="list-style-type: none"> <li>» the composition of the final acceptable vegetation will be based on the vegetation descriptions of the original ecological EIA investigation, and will include rescued plant material</li> <li>» geophytic plants shall be planted in groups or as features in selected areas</li> <li>» during transplanting care shall be taken to limit or prevent damage to roots</li> <li>» plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots</li> </ul>	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
<p>Traffic on revegetated areas</p> <ul style="list-style-type: none"> <li>» designated tracks shall be created for pedestrian of vehicle traffic where necessary</li> <li>» Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed</li> <li>» All livestock shall be excluded from newly revegetated areas, until vegetation is well established</li> </ul>	Contractor, ECO to control	Construction phase Operational phase
<p>Establishment</p> <ul style="list-style-type: none"> <li>» The establishment and new growth of revegetated and replanted species shall be closely monitored                             <ul style="list-style-type: none"> <li>○ Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created</li> </ul> </li> </ul>	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
<b>Monitoring and follow-up treatments</b>		
<p>Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan</p> <ul style="list-style-type: none"> <li>» Erosion shall be monitored at all times and measures taken as soon as detected</li> <li>» Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created</li> </ul>	ECO during construction, suitable designated person / contractor after that	Construction phase Operational phase
Weeding	Contractor	Construction



Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>» It can be anticipated that invasive species and weeds will germinate on rehabilitated soils                             <ul style="list-style-type: none"> <li>○ These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate</li> <li>○ Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications</li> </ul> </li> </ul>		phase Operational phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No activity in identified no-go areas</li> <li>» Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist</li> <li>» The structural integrity and diversity of natural plant communities is recreated or maintained</li> <li>» Indigenous biodiversity continually improves according to the pre-determined desirable end state                             <ul style="list-style-type: none"> <li>○ This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state</li> </ul> </li> <li>» Ecosystem function of natural landscapes and their associated vegetation is improved or maintained</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Fortnightly inspections of the site by ECO during construction</li> <li>» An incident reporting system must record non-conformances to the EMP.</li> <li>» Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established                             <ul style="list-style-type: none"> <li>○ These inspections should be according to the monitoring protocol set out in the rehabilitation plan</li> </ul> </li> <li>» Thereafter annual inspections according to the minimal monitoring protocol</li> </ul>

**MANAGEMENT PROGRAMME: OPERATION**

**CHAPTER 8**

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

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

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

**8.1. Objectives**

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

**OBJECTIVE OP1: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation**

Indirect impacts on vegetation and fauna during operation could result from maintenance activities and the movement of people and vehicles on site and in the surrounding area. 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>» Areas requiring regular maintenance.</li> <li>» Route of the security team.</li> <li>» Areas disturbed during the construction phase and subsequent rehabilitation at its completion.</li> <li>» Areas where the natural microclimate and thus vegetation composition has changed due to structures such as PV panels erected.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of vegetation and/or habitat.</li> <li>» Environmental integrity of site undermined resulting in reduced</li> </ul>

	visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Movement of employee vehicles within and around site.</li> <li>» Excessive shading by PV panels.</li> <li>» Altered rainfall interception and resultant runoff patterns by infrastructure.</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>
Vehicle movements must be restricted to designated roadways.	Operator	Operation
No disturbance of vegetation outside of the project site must occur.	Operator	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Operator	Operation
An on-going invasive and alien plant monitoring and eradication programme must be implemented, where necessary (refer to Appendix B).	Operator	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Operator in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
A botanist familiar with the vegetation of the area should monitor the vegetation composition and – density immediately adjacent to new infrastructure and decide on additional revegetation measures that may be required to maintain sufficient vegetation to prevent habitat degradation and accelerated erosion, especially underneath/around PV panels.	Operator in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No further disturbance to vegetation or terrestrial faunal habitats.</li> <li>» Continued improvement of rehabilitation efforts.</li> <li>» No disturbance of vegetation outside of project site.</li> <li>» No further thickening of invasive shrubs on site.</li> <li>» Gradual disappearance of all alien plant species on site.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation on-site by facility manager and environmental manager.</li> <li>» Regular inspections to monitor plant regrowth/performance of</li> </ul>

rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

## OBJECTIVE OP2: Manage and reduce the impact of invasive vegetation

Within the project area invasive species – indigenous and alien - occur, which all have a potential of reproducing to such an extent that the ecosystem within and beyond the project area could be impaired. A detailed Invasive Management Plan need to be drafted after the pre-construction walk-through. Operational standards must adhere to those set out by Working for Water. The use of chemicals may only commence with the approval of the relevant authorities.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV Array</li> <li>» Grid connection and associated servitudes</li> <li>» Temporary construction camps</li> <li>» Workshops and/or other permanent infrastructure</li> <li>» Access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impacts on natural vegetation.</li> <li>» Impacts on soil.</li> <li>» Impact on faunal habitats.</li> <li>» Loss of agricultural potential.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Transport of construction materials.</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 road.</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To avoid the introduction of additional alien invasive plants to the project control area.</li> <li>» To avoid further distribution and thickening of existing alien plants on the project area.</li> <li>» To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the project control area.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Compile a detailed invasive plant management and monitoring programme as guideline for the entire construction, operational and decommissioning phase. This plan must contain WfW-accepted species- specific eradication methods. It must also provide for a continuous monitoring programme to detect new infestations	Specialist	Pre-construction
Avoid creating conditions in which invasive plants may	Operator	Construction

Mitigation: Action/Control	Responsibility	Timeframe
become established: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Shred all non-seeding material from cleared invasive shrubs and other vegetation an use as mulch as part of the rehabilitation and revegetation plan » Do not import soil from areas with alien plants		phase Operational phase
» Eradicate all invasive plants that occur within the development's temporary and permanent footprint areas » Ensure that material from invasive plants that can regenerate – seeds, suckers, plant parts are adequately destroyed and not further distributed	Operator	Construction phase Operational phase
» Immediately control any alien plants that become newly established using registered control measures	Operator	Construction phase Operational phase

<b>Performance Indicator</b>	» Visible reduction of number and cover of alien invasive plants within the project area. » Improvement of vegetation cover from current dominance of invasive shrubs to dominance of perennial grasses and dwarf shrubs » No establishment of additional alien invasive species.
<b>Monitoring</b>	» Ongoing monitoring of area by the environmental manager during operation » Audit every two to three years by a suitably qualified botanist to assess the status of infestation and success of eradication measures » If new infestations are noted these must be recorded. A comprehensive eradication programme with the assistance of the WfW (Working for Water) Programme is advisable.

**OBJECTIVE OP3: The mitigation and possible negation of visual impacts associated with the operation of the Proposed Bosjesmansberg PV East Solar Energy Facility.**

<b>Project Component/s</b>	Solar energy facility and ancillary infrastructure (i.e. the substation, internal access roads, workshop and office).
<b>Potential Impact</b>	Visual impact of facility degradation and vegetation rehabilitation failure.
<b>Activity/Risk</b>	The viewing of the above mentioned by observers on or near the

<b>Source</b>	site (i.e. within 2,5km of the site).		
<b>Mitigation: Target/Objective</b>	Well maintained and neat facility.		
<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>	
Maintain the general appearance of the facility as a whole, including the PV structures, the internal roads, servitudes and the ancillary buildings.	Developer / operator	Throughout the operational phase.	
Maintain roads to forego erosion and to suppress dust.	Developer / operator	Throughout the operational phase.	
Monitor rehabilitated areas, and implement remedial action as and when required.	Developer / operator	Throughout the operational phase.	
<b>Performance Indicator</b>	Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.		
<b>Monitoring</b>	Monitoring of the entire site on an on-going basis (by operator).		

**OBJECTIVE OP4: Minimise soil degradation and erosion (Erosion Management Plan)**

The soil on site may be impacted in terms of:

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

Management of erosion will be required during the operation phase of the facility. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management Plan (Appendix C).

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Power line.</li> <li>» Ancillary buildings.</li> <li>» Access roads.</li> </ul>
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<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Soil degradation.</li> <li>» Soil erosion.</li> <li>» Increased deposition of soil into drainage systems.</li> <li>» Increased run-off over the site.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Poor rehabilitation and/or revegetation of cleared areas.</li> <li>» Rainfall - water erosion of disturbed areas.</li> <li>» Wind erosion of disturbed areas.</li> <li>» Concentrated discharge of water from construction activity.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure rehabilitation of disturbed areas is maintained.</li> <li>» Minimise soil degradation (i.e. wetting).</li> <li>» Minimise soil erosion and deposition of soil into drainage lines.</li> <li>» Ensure continued stability of embankments/excavations.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Operator	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).	Operator	Operation
Develop and implement an appropriate stormwater management plan for the operational phase of the facility	Operator	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Acceptable level of soil erosion around site, as determined by the environmental manager.</li> <li>» Acceptable level of increased siltation in drainage lines, as determined by the site manager.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Inspections of site on a bi-annual basis by the operation phase ECO</li> </ul>

#### OBJECTIVE OP4: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from the facility. 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>» Hard engineered surfaces.</li> <li>» On-site vehicles.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Dust and particulates from vehicle movement to and on-site.</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> </ul>

	» Fuel burning vehicle and construction engines.
<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> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Roads must be maintained to a manner that will ensure that nuisance impacts to the community from dust is not visibly excessive.	Operator	Operation
Appropriate dust suppressants must be applied to the roads as required to minimise/control airborne dust.	Operator	Duration of contract
Speed of vehicles must be restricted on site, as defined by the Environmental Manager.	Operator	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>» Dust suppression measures implemented where required.</li> </ul>
<b>Monitoring</b>	<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 reporting system must be used to record non-conformances to the EMPr.</li> </ul>

**OBJECTIVE OP5: Ensure the implementation of an appropriate fire management plan during the operation phase**

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

<b>Project Component/s</b>	» Operation and maintenance of the solar energy facility and associated infrastructure.
<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 solar energy 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.



Mitigation: Action/Control	Responsibility	Timeframe
Join the local Fire Protection Agency.	Operator	Operation
Provide adequate fire fighting equipment at specified localities on the PV facility to meet emergencies from fire.	Operator	Operation
Provide adequate fire fighting equipment on site.	Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Operator	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).	Operator	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.	Operator	Operation
Contact details of emergency services should be prominently displayed on site.	Operator	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Fire-fighting equipment and appropriate training provided before the operational phase commences.</li> <li>» Appropriate fire breaks in place and maintained.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Developer must monitor indicators listed above to ensure that they have been met.</li> </ul>

**OBJECTIVE OP6: Maximise local employment and business opportunities associated with the operational phase**

The facility is expected to be operational for 25 years during which time approximately 7-15 staff members are expected to be required on-site. Therefore, long-term direct job opportunities for locals could exist, although limited. However, in an area with such high unemployment figures, these limited opportunities should still be seen as a positive impact on the quality of life of those benefiting from the employment.

Some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. These opportunities for local service providers to render services to the proposed facility could include maintenance of

the guardhouse, gardening at the guardhouse, cleaning services, security services and maintenance or replacement of general equipment

<b>Project Component/s</b>	» Day to day operational activities associated with the PV facility, including maintenance .
<b>Potential Impact</b>	» The opportunities and benefits associated with the creation of local employment and business should be maximised
<b>Activities/Risk Sources</b>	» The operational phase of the PV facility will create up to 15 full time employment opportunities.
<b>Mitigation: Target/Objective</b>	» In the medium to long term employ as many locals as possible to fill the full time employment opportunities.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The workforce staff is likely to be based in the region. The developer should commit to implementing a training and skills development and training programme to maximise employment for locals.	Operator	Prior to commencement of operation
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	Operator	Prior to commencement of operation

<b>Performance Indicator</b>	» Training and skills development programme developed and designed before construction phase completed. » Potential locals identified before construction phase completed.
<b>Monitoring</b>	» The developer must monitor indicators listed above to ensure that they have been met for the operational phase.

### OBJECTIVE OP7: Appropriate handling and management of waste

The operation of the 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, and liquid waste. A guideline for integrated management of waste is included as Appendix D of this EMPr.

<b>Project Component/s</b>	» Substation. » Operation and maintenance staff. » Workshop.
<b>Potential Impact</b>	» Inefficient use of resources resulting in excessive waste generation.

	<ul style="list-style-type: none"> <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 and switchgear for the substations.</li> <li>» Ancillary buildings.</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>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Hazardous substances (such as used/new transformer oils) must be stored in sealed containers within a clearly demarcated designated area.	Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Operator	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.	Operator	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.	Operator	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Operator	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Operator / waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Operator/ waste management contractor	Operation
Used oils and chemicals: <ul style="list-style-type: none"> <li>» Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority</li> <li>» Waste must be stored and handled according to the relevant legislation and regulations</li> </ul>	Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Operator	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Operator	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Operator	Operation

<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 environmental manager .</li> <li>» All appropriate waste disposal certificates accompany the monthly reports.</li> </ul>

**OBJECTIVE OP8: To avoid and or minimise the potential impacts of safety, noise and dust and damage to roads during the operational phase**

<b>Project Component/s</b>	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure .
<b>Potential Impact</b>	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
<b>Activities/Risk Sources</b>	» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and minimise damage to roads.

Mitigation: Action/Control	Responsibility	Timeframe
Establish and maintain a register for their periodic review that logs all complaints raised by the landowner, occupiers or the general public about operational activities. The register shall be regularly updated and records maintained, including the name of the complainant, his or her domicile and contact details, the date and nature of the complaint and if any action that was taken to rectify the problem.	Operator	Operational Life of Facility
Institute and maintain security and access control to the site	Operator	Operational Life of Facility
Set up signage warning of on-site hazards	Operator	Operational Life of Facility
Conduct regular technical inspections and site maintenance activities.	Operator	Operational Life of Facility
maintain security fencing on the perimeter and around electrical substations	Operator	Operational Life of Facility
Develop and implement emergency response procedures and carry out regular review of emergency response procedures	Operator	Operational Life of Facility

**OBJECTIVE OP9: To avoid and or minimise the potential impacts due to cleaning of the PV panels using water**

In certain instances, water is also used for cleaning the panels to remove dust or dirt that builds up on the panels.

<b>Project Component/s</b>	» Cleaning PV panels with water
<b>Potential Impact</b>	» Run-Off, erosion / sedimentation
<b>Activities/Risk Sources</b>	» Cleaning PV panels with water
<b>Mitigation: Target/Objective</b>	» No negative impacts due to use of water for cleaning panels

Mitigation: Action/Control	Responsibility	Timeframe
Use as little water as possible for cleaning the panels	Operator	Operational Life of the facility
Confirm a legal source of water prior to the operational phase of the project and obtain any	Operator	Operational Life of the facility

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
required water use license		
Regular inspection during cleaning events to monitor use of water	Operator	Operational Life of the facility
Re-use grey water if possible	Operator	Operational Life of the facility

**MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9**

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of 25 years (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

*The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which may require this section of the EMPr to be revisited and amended.*

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

**9.1. Site Preparation**

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

**9.2 Disassemble Infrastructure**

Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

**OBJECTIVE D1: To avoid and or minimise the potential impacts associated with the decommissioning phase**

<b>Project Component/s</b>	» Decommissioning phase of the PV facility and associated infrastructure
<b>Potential Impact</b>	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression . However, the number of people

	affected is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
<b>Activity/Risk Source</b>	» Decommissioning of the PV facility
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV facility.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Explore options of re-use and recycling of the PV facility components/ structures. This will be informed by legislative requirements, environmental analyses and costs at the time.	Developer	Prior to decommissioning
Where disposal of components and materials is required, this must be appropriately carried out in accordance with prevailing legal requirements, in designated waste disposal facilities.	Developer	When PV facility is decommissioned
Due to the disturbance at the site during decommissioning, alien plant species are likely to invade the site and a long-term control plan will need to be implemented for several years after decommissioning	Developer	When PV facility is decommissioned
Retrenchments should comply with South African Labour legislation of the day	Developer	When PV facility is decommissioned
Undertake site rehabilitation to restore the environment to a condition whereby the natural functioning of the ecosystem can take place	Developer	When PV facility is decommissioned
If scarring of the landscape/ site occurs, utilised landscaping to restore the site	Developer	When PV facility is decommissioned
Re-vegetate disturbed areas utilising indigenous plant species.	Developer	When PV facility is decommissioned

<b>Performance Indicator</b>	» South African Labour legislation relevant at the time » Area appropriately rehabilitated.
<b>Monitoring</b>	» Monitoring of decommissions activities

**OBJECTIVE D2: The mitigation and possible negation of visual impacts associated with the decommissioning of the Proposed Bosjesmansberg PV East Solar Energy Facility.**

<b>Project Component/s</b>	Solar energy facility and ancillary infrastructure (i.e. the substation, internal access roads, workshop and office).
<b>Potential Impact</b>	Visual impact of residual visual scarring and vegetation



	rehabilitation failure.		
<b>Activity/Risk Source</b>	The viewing of the above mentioned by observers on or near the site (i.e. within 2,5km of the site).		
<b>Mitigation: Target/Objective</b>	Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas.		
<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>	
Remove infrastructure not required for the post-decommissioning use of the site. This may include the internal roads, substation, ancillary buildings etc.	Developer / operator	During the decommissioning phase.	
Rehabilitate access roads not required for the post-decommissioning use of the site. Consult an ecologist to give input into rehabilitation specifications.	Developer / operator	During the decommissioning phase.	
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Developer / operator	Post decommissioning.	
<b>Performance Indicator</b>	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.		
<b>Monitoring</b>	Monitoring of rehabilitated areas quarterly for at least a year following decommissioning.		

## **FINALISATION OF THE EMPr**

## **CHAPTER 10**

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The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications following the final walk-through survey by specialists of the PV facility development area, power line. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.

**APPENDIX A:  
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS  
AND ISSUES**

## **GRIEVANCE MECHANISM / PROCESS**

### **AIM**

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

- Fair and equitable;
- Open and transparent;
- Accountable and efficient.

It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

### **Proposed generic grievance process**

- Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
- The grievance will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
- The contact person will draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting.
- Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism

process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

- The meeting will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent. The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.
- Draft copies of the minutes will be made available to the Complainant and the proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.
- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome will be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s will note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned;
- In the event that the parties agree to appoint a mediator, the proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the proponent, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will provide a person to take minutes of and record the meeting/s.
- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome will be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator will prepare a draft report that summarizes the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.

- The draft report will be made available to the Complainant and the proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days.

The way forward will be informed by the recommendations of the mediator and the nature of the grievance. As indicated above, the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the proponent, either party may be of the opinion that legal action may be the most appropriate option.

**APPENDIX B:  
DEPARTMENT OF WATER AFFAIRS: WORKING  
FOR WATER PROGRAMME PRINCIPLES FOR  
INVASIVE PLANT SPECIES**

**APPENDIX C:  
PRINCIPLES FOR EROSION MANAGEMENT**



**APPENDIX D:  
GUIDELINES FOR INTEGRATED MANAGEMENT OF  
CONSTRUCTION WASTE**

**APPENDIX E:  
PRINCIPLES FOR PLANT SEARCH AND RESCUE,  
REHABILITATION AND RE-VEGETATION**