

# QUANTUM 1 SOLAR ENERGY FACILITY, GAUTENG PROVINCE

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## ENVIRONMENTAL MANAGEMENT PROGRAMME

**August 2023**

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## EMPR DETAILS

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<b>GDARD Reference No.</b>	:	TBC
<b>Title</b>	:	Basic Assessment Process Environmental Management Programme: Quantum 1 Solar Energy Facility.
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<b>Client</b>	:	South Africa Mainstream Renewable Power Developments (Pty) Ltd
<b>Report Status</b>	:	Environmental Management Programme submitted as part of the BA report to for a 30-day review period
<b>Date</b>	:	August 2023

**When used as a reference this report should be cited as:** Savannah Environmental (2023) Environmental Management Programme: Quantum 1 Solar Energy Facility.

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## DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

**Cumulative impacts:** Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

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

**Development area:** The development area is that identified area (located within the project site ~250ha) which has been assessed by specialists with the aim of identifying areas of sensitivity which should be avoided by the development footprint or facility layout.

**Development footprint:** The development footprint is the defined area (located within the development area) where the solar energy facility and other associated infrastructure for the Project is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

**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.

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

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

**Endemic:** An "endemic" is a species that grows/occur 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 assessment practitioner (EAP):** An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

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

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

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

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

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

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

**Incident:** Section 30 of NEMA defines an 'incident' as "an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed."<sup>1</sup>

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

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

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

**Mitigation hierarchy:** The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities

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

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

**Project developer:** The project developer, South Africa Mainstream Renewable Power Developments (Pty) Ltd will be the party responsible for the construction and day-to-day operation and maintenance of the proposed solar energy facility.

**Project site:** The project site is the aerial extent of the affected properties (~20ha) within which the solar energy facility is proposed.

**Proponent:** Applicant/Project developer, South Africa Mainstream Renewable Power Developments (Pty) Ltd will be the party responsible for the construction and day-to-day operation and maintenance of the proposed solar energy facility.

**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

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<sup>1</sup><http://ipwis.pgwc.gov.za/ipwisdoc/Public/Publications/ChemicalsMgt/A%20Procedure%20for%20Section%2030%20of%20NEMA.pdf>

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.

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

## ABBREVIATIONS AND ACRONYMS

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BESS	Battery Energy Storage System
DEFF	National Department of Environment, Forestry and Fisheries
DHSWS	Department of Human Settlements, Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EPC	Engineering Procurement Contractor
ECO	Environmental Control Officer
EO	Environmental Officer
GG	Government Gazette
GDARD	Gauteng Provincial Department of Agriculture and Rural Development
GN	Government Notice
Ha	Hectare
I&AP	Interested and Affected Party
km <sup>2</sup>	Square kilometres
kV	Kilovolt
m <sup>2</sup>	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
PM	Project Manager
SHE	Safety, Health and Environment
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SEF	Solar Energy Facility

## TABLE OF CONTENTS

	<b>Page</b>
<b>EMPR DETAILS</b> .....	<b>ii</b>
<b>DEFINITIONS AND TERMINOLOGY</b> .....	<b>iii</b>
<b>ABBREVIATIONS AND ACRONYMS</b> .....	<b>vii</b>
<b>TABLE OF CONTENTS</b> .....	<b>viii</b>
<b>APPENDICES</b> .....	<b>x</b>
<b>CHAPTER 1: INTRODUCTION</b> .....	<b>1</b>
<b>CHAPTER 2: PROJECT DETAILS</b> .....	<b>2</b>
2.1. Findings of the Basic Assessment (BA) and Identified Environmental Sensitivities .....	5
2.2 Impacts on Terrestrial Ecology (including flora and fauna) .....	<b>Error! Bookmark not defined.</b>
2.3 Impacts on Soils and Agricultural Potential.....	<b>Error! Bookmark not defined.</b>
2.4 Impacts on Heritage Resources (including Archaeology and Palaeontology)	<b>Error! Bookmark not defined.</b>
<b>defined.</b>	
2.5 Social Impacts .....	<b>Error! Bookmark not defined.</b>
<b>CHAPTER 3: Purpose and objectives of the empr</b> .....	<b>8</b>
<b>CHAPTER 4: STRUCTURE OF THIS EMPr</b> .....	<b>10</b>
4.1. Project Team.....	11
<b>CHAPTER 5: ROLES AND RESPONSIBILITIES</b> .....	<b>12</b>
OBJECTIVE 1: Establish clear reporting, communication, and responsibilities during construction in relation to the overall implementation of the EMPr .....	12
OBJECTIVE 2: Establish clear reporting, communication, and responsibilities during operation in relation to overall implementation of the EMPr during operation .....	15
<b>CHAPTER 6: MANAGEMENT PROGRAMME: PLANNING AND DESIGN</b> .....	<b>17</b>
6.1. Objectives .....	17
OBJECTIVE 1: To ensure that the design of the facility responds to the identified environmental constraints and opportunities .....	17
OBJECTIVE 2: Ensure that relevant permits and site-specific plans are in place to manage impacts on the environment.....	19
OBJECTIVE 3: Ensure compliance of required mitigation measures and recommendations by contractors	21
OBJECTIVE 4: To ensure effective communication mechanisms .....	22
<b>CHAPTER 7: MANAGEMENT PROGRAMME: CONSTRUCTION</b> .....	<b>25</b>
7.1. Objectives .....	25
OBJECTIVE 1: Securing the site and site establishment.....	25
OBJECTIVE 2: Appropriate management of the construction site and construction workers.....	27
OBJECTIVE 3: Maximise local employment and business opportunities associated with the Construction ...	31
OBJECTIVE 4: Avoid the negative social impacts on family structures and social networks due to the presence of construction workers from outside the area.....	32
OBJECTIVE 5: Management of dust and emissions and damage to roads.....	34
OBJECTIVE 6: Conservation of the existing soil resource within the site and in the adjacent areas.....	37
OBJECTIVE 7: Minimise the impacts on and loss of indigenous vegetation, control of alien invasive plants and impact to freshwater resources.....	40
OBJECTIVE 8: Protection of terrestrial fauna.....	44
OBJECTIVE 9: Protection of avifauna .....	46
OBJECTIVE 11: Minimisation of visual impacts associated with construction.....	49
OBJECTIVE 12: Appropriate handling and management of waste .....	50



OBJECTIVE 13: Appropriate handling and storage of chemicals, hazardous substances.....	53
OBJECTIVE 15: Traffic management and transportation of equipment and materials to site .....	58
OBJECTIVE 16: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed .....	60
OBJECTIVE 17: Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the project area; .....	62
OBJECTIVE 18: Prevent the direct and indirect loss and disturbance of faunal species and community (including potential SCCs) .....	64
7.2. Detailing Method Statements.....	65
OBJECTIVE 19: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk .....	65
7.3. Awareness and Competence: Construction of the Quantum 1 SEF.....	68
OBJECTIVE 20: 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.....	68
7.4. Monitoring Programme: Construction of the solar energy facility .....	69
OBJECTIVE 21: To monitor the performance of the control strategies employed against environmental objectives and standards.....	69
<b>CHAPTER 8: MANAGEMENT PROGRAMME: OPERATION .....</b>	<b>72</b>
8.1. Objectives .....	72
OBJECTIVE 1: Securing the site and general maintenance during operation .....	72
OBJECTIVE 2: Protection of indigenous vegetation, fauna and maintenance of rehabilitation .....	74
OBJECTIVE 3: Minimisation of visual impact .....	77
OBJECTIVE 4: Appropriate management of stormwater and erosion control .....	79
OBJECTIVE 5: Appropriate handling and management of hazardous substances and waste .....	80
OBJECTIVE 6: Ensure appropriate operation and maintenance of the battery energy storage system .....	82
OBJECTIVE 7: Maximise benefits and opportunities for local communities associated with the operation of the solar energy facility.....	83
OBJECTIVE 8: Implement an appropriate fire management plan during the operation phase.....	84
OBJECTIVE 9: Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the project area .....	85
OBJECTIVE 10: Prevent the direct and indirect loss and disturbance of faunal species and community (including potentially/occurring SCCs) .....	86
8.2. Monitoring Programme: Operation Phase of the solar energy facility.....	87
OBJECTIVE 11: To monitor the performance of the control strategies employed against environmental objectives and standards.....	87
<b>CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING .....</b>	<b>89</b>
9.1. Objectives .....	89

## APPENDICES

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- Appendix A:** Facility Layout and Sensitivity Maps
- Appendix B:** Grievance Mechanism for Public Complaints and Issues
- Appendix C:** Open Space Management Plan
- Appendix D:** Re-Vegetation and Habitat Rehabilitation Plan
- Appendix E:** Plant Rescue and Protection Plan
- Appendix F:** Traffic and Transportation Management Plan
- Appendix G:** Stormwater Management Plan and Erosion Management Plan
- Appendix H:** Waste Management Plan
- Appendix I:** Emergency Preparedness, Response and Fire Management Plan
- Appendix J:** Chance Finds Procedure
- Appendix K:** Curriculum Vitae of the Project Team

## CHAPTER 1: INTRODUCTION

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This Environmental Management Programme has been compiled for the Quantum 1 Solar Energy Facility ("SEF"), and associated infrastructure ("Quantum 1 SEF"). The facility is to be constructed on Portion 285 (a portion of portion 19) of the Farm Vlakplaats 160, located approximately 7.2km west of Krugersdorp, within the Mogale City Local Municipality in the West Rand District Municipality in the Gauteng Province.

The Quantum 1 SEF will utilise PV technology and have a generating capacity of up to 10MWac. Electricity generated will be evacuated from an onsite substation via 11kV monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. A corridor 50m wide and 0.1- 0.12km long.

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

In terms of the Duty of Care provision in S28(1) of the National Environmental Management Act (Act 107 of 1998) (NEMA) the project Developer must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, halted or minimised. In terms of NEMA, it has become the legal duty of a project Developer to consider a project holistically, and to consider the cumulative effect of a variety of impacts.

## CHAPTER 2: PROJECT DETAILS

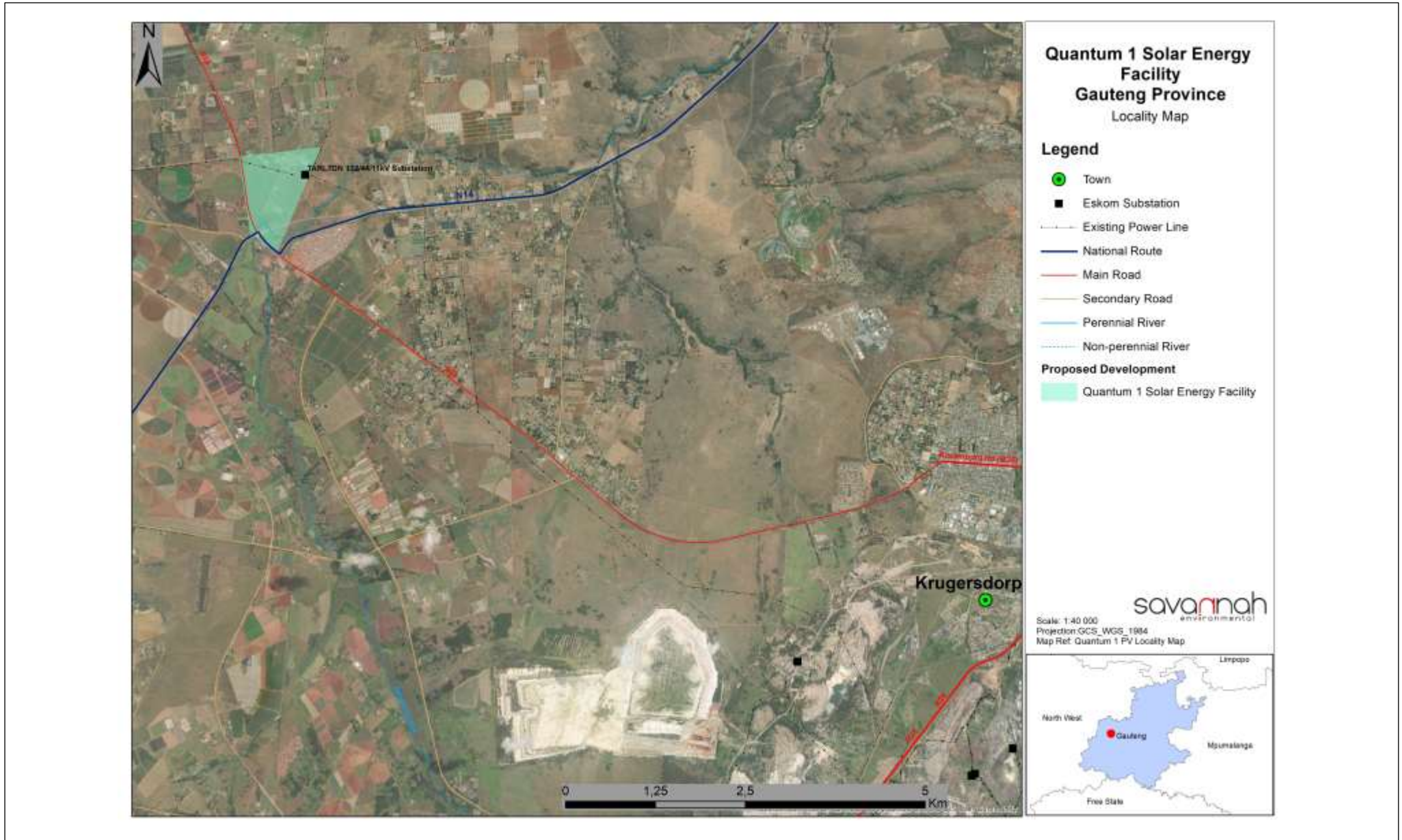
A preferred development area with an extent of ~94.1479ha has been identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd as technically suitable for the development of the Quantum 1 Solar Energy Facility. The facility will comprise the following infrastructure:

- » Solar PV array comprising solar modules.
- » Mounting System Technology
- » Inverters and transformers.
- » Low voltage cabling between the PV modules to the inverters.
- » Overhead power lines
- » Onsite substation, switching substation and laydown areas.
- » Battery Energy Storage System (BESS) and associated infrastructure.
- » Internal access roads.
- » Fence around the project development areas.
- » Occupation and Maintenance (O&M) buidlings

**Table 2.1:** Detailed description of the Quantum 1 SEF project site

Component	Description / Dimensions
District Municipality	West Rand District Municipality
Local Municipality	Mogale City Local Municipality
Ward Number (s)	Ward 30
Nearest town(s)	Krugersdorp (7.2km east)
Farm name(s) and number(s) of properties affected by the PV Facility, incl SG 21 Digit Code (s)	Portion 265 (a portion of portion 19) of the Farm Vlakplaats 160 (TOIQ00000000016000265)
Current zoning	Agriculture
Site Coordinates (centre of development area)	26° 4'8.17"S, 27°38'55.89"E
Total extent of the Affected Properties, also referred to as the project site	~94.1479ha
Total extent of the Development area	~94.1479ha
Panel Height	Height: ~up to 5m from ground level (installed).
Technology	Static or Tracking Photovoltaic Systems Bifacial or monofacial
Contracted Capacity	Up to 10MWac
Area occupied by the solar array	Up to 19.99ha
Area occupied by the on-site facility substation	Up to 0.2ha falling within a 1.5Ha area reserved for the substation and all associated infrastructures
Capacity of on-site facility substation	11kV onsite substation
Cabling between the PV array and the onsite substation	Up to 11kV underground cabling
Coordinates of on-site facility substation	26° 4'8.74"S 27°39'5.80"E (centre coordinates)
Battery Energy Storage System (BESS)	Capacity to be confirmed. The BESS will fall within the footprint reserved for the substation and associated infrastructure.
Extent of areas required for laydown of materials, equipment etc.	Will fall within the 1.5ha area reserved for the substation, BESS and all associated infrastructures.

Access and internal roads	Existing roads will be used as far as possible. There are existing gravel roads that can be utilized for site access (width of up to 6m). Upgrading of existing roads or new roads may be required.
Grid connection	To be evacuated from the onsite substation via 11kV Monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. This will form part of a separate EA process.
Temporary infrastructure	Will fall within the 1.5ha area reserved for the substation, BESS and all associated infrastructures.



**Figure 2.1:** Locality map showing the location of the project site proposed for the Quantum 1 SEF and associated infrastructure.

## 2.1. Summary of the Findings of the Basic Assessment (BA)

The preceding sections of this report, together with the specialist studies contained within **Appendices G1-G9** provide a detailed assessment of the potential impacts that may result from the development of Quantum 1 SEF.

No environmental fatal flaws or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented.

The potential environmental impacts associated with Quantum 1 SEF assessed through the BAR process include:

- » Impacts on terrestrial ecology (flora and fauna)
- » Impacts on freshwater ecology.
- » Impacts on avifauna.
- » Impacts on soils and agricultural potential.
- » Impacts on heritage resources, including archaeology, palaeontology and the cultural landscape.
- » Visual impacts on the area imposed by the components of the facility.
- » Positive and negative social impacts.
- » Traffic impacts on the area.

The following provides a summary of the conclusions of the specialist studies undertaken:

- » It is the opinion of the ecological specialist that the proposed development of the Quantum 1 Solar Energy Facility and associated infrastructure (in the locality and spatial extent as indicated at the time of the assessment) can be favourably considered for authorisation as the survey results indicated that it would not impose any significant impacts to the terrestrial habitats and the ecological processes associated with them provided that the recommended mitigation measures are adhered to.
- » It is the opinion of the freshwater specialist that the proposed development of the Quantum 1 Solar Energy Facility and associated infrastructure (in the locality and spatial extent as indicated at the time of the assessment) can be favourably considered for authorisation as the survey results indicated that it would not impose any significant impacts to the surface water ecosystems within the area provided that the recommended mitigation measures are adhered to.
- » The proposed 10 MW Quantum 1 SEF will have anticipated high, medium, and low negative impacts on priority avifauna, which is expected to be reduced to medium and low with appropriate mitigation. No fatal flaws were discovered during the on-site investigations. The development is supported provided the mitigation measures listed in the avifauna report are strictly implemented.
- » Even though the broader area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources of significance were identified during the survey. In addition, no structures of cultural value or graves were identified. As such, this development is not considered to be a sensitive archaeological landscape. On condition that the recommendations outlined in the HIA are implemented, there is no objection to the proposed development from a heritage perspective.
- » Overall, the significance of the visual impacts is expected to range from moderate to low, as a result of the existing visual clutter and urban development surrounding the site. A number of mitigation measures have been proposed in the VIA. If mitigation is undertaken as recommended, it is concluded

that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the Quantum 1 SEF was considered to be acceptable from a visual impact perspective and was recommended for authorization by the respective specialist.

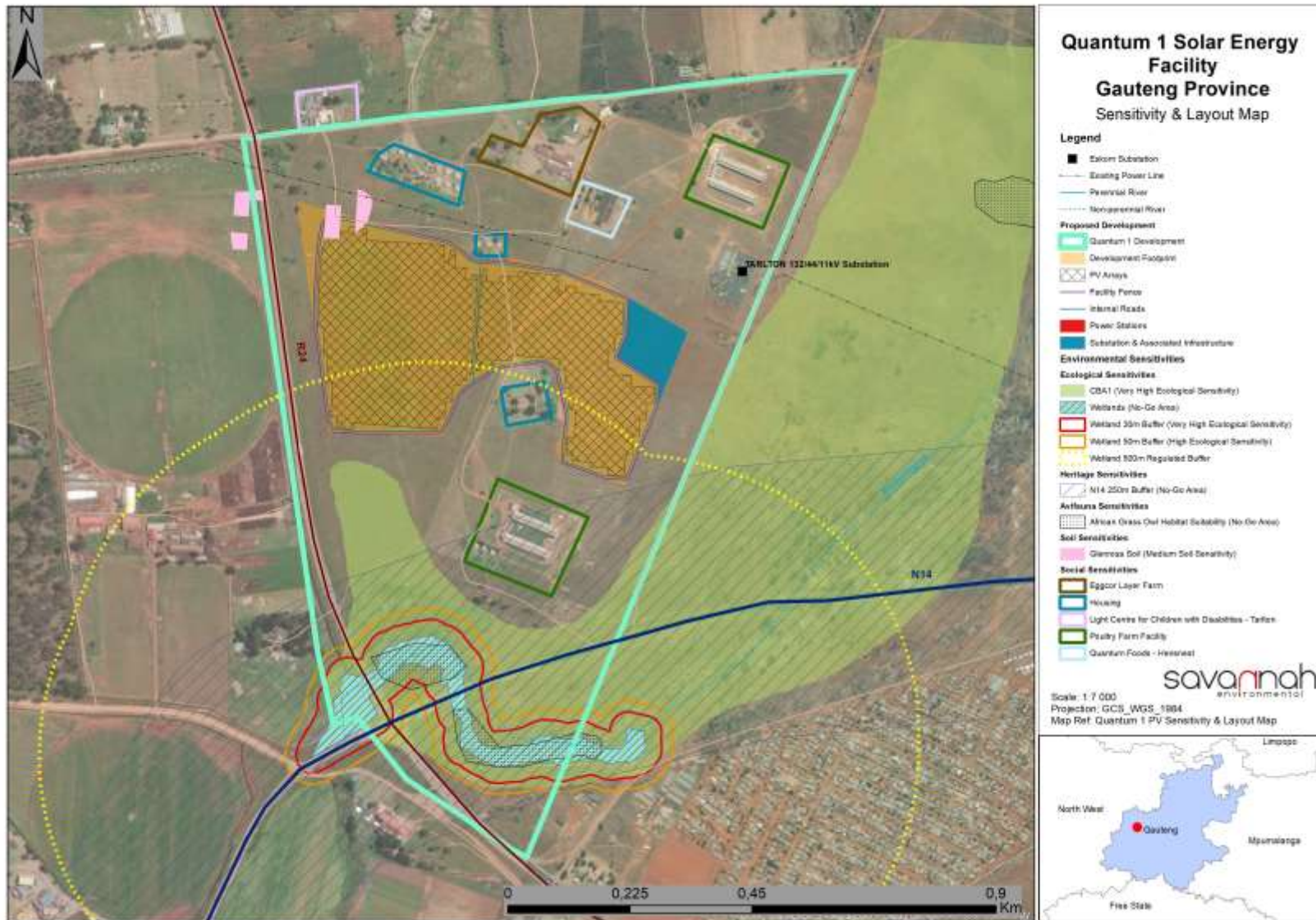
- » The proposed Quantum 1 Solar Energy Facility and associated infrastructure is unlikely to result in permanent damaging social impacts. The Quantum 1 Solar Energy Facility has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of several socio-economic opportunities for the region, which in turn, can result in positive social benefits. From a social perspective, it was concluded that the proposed project and associated infrastructure is acceptable and should be developed subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report
- » The construction and decommissioning phases of a solar power facility are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is of temporary nature, i.e., the impact of the solar power facility on the external traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network. The proposed development of the Quantum 1 SEF Energy Facility is supported from a traffic engineering perspective provided that the recommended mitigation measures are adhere to.
- » Considering the low sensitivities associated with land potential resources, it is the specialist's opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities may proceed as have been planned as no loss of land capability is evident. It is also expected that no segregation of high production agricultural resources will occur.

Based on the specialist studies undertaken for the project, no fatal flaws were identified to be associated with the development of the project, and all specialists concluded that the project can proceed with the implementation of the recommended mitigation measures. The opportunities presented by the development will be lost if the no-go alternative is applied and this alternative is therefore not considered desirable. The negative impacts of the no-go alternative are considered to outweigh the positive impacts of this alternative. Therefore, the proposal (i.e. Quantum PV Facility) is the preferred alternative for implementation.

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer and the potential to minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that Quantum 1 SEF is acceptable within the landscape and can reasonably be authorised subject to implementation of mitigation and enhancement measures recommended by the specialists.

The environmentally sensitive areas which have been identified through the BA process are illustrated in **Figure 2.2**.





**Figure 2.2:** Environmental Sensitivity Map from the results of the scoping evaluation for the Quantum 1 SEF and associated infrastructure. The sensitivity map indicates the sensitivities for the project site, as well as the Quantum 1 SEF development area (indicated with the turquoise outline).

## CHAPTER 3: PURPOSE AND OBJECTIVES OF THE EMPr

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

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

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

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the Quantum 1 SEF and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management). The specifications have been developed on the basis of the findings of the Environmental Impact Assessment (EIA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

The EMPr has the following objectives:

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

- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the BA process.

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

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

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

## CHAPTER 4: STRUCTURE OF THIS EMPR

The first three chapters provide background to the EMPr and the Quantum 1 SEF, while the chapters which follow consider the following:

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

These chapters set out the procedures necessary for South Africa Mainstream Renewable Power Developments (Pty) Ltd as the project owner, 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 BA specialist studies**

<b>Project component/s</b>	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	Brief description of potential environmental impact if objective is not met.
<b>Activity/risk source</b>	Description of activities which could impact on achieving objective.
<b>Mitigation: Target/Objective</b>	Description of the target; include quantitative measures and/or dates of completion.

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

<b>Performance Indicator</b>	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
<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 throughout the life of the solar energy facility whenever changes, such as the following, occur:

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

**4.1. Project Team**

This EMPr was compiled by:

<b>EMPr Compilers</b>	
Michael Morreira	Savannah Environmental
Chantelle Geyer	Savannah Environmental
Jo-Anne Thomas	Savannah Environmental
Dovhani Munyembane	Savannah Environmental
<b>Input from Specialist Consultants</b>	
Mathew Ross of EnviRoss	Terrestrial Ecology Impact Assessment
Albert Froneman of The Chris Vanrooyen Consulting	Avifauna Impact Assessment
Andrew Husted of The Biodiversity Company	Soils and agricultural potential
Mathew Ross of EnviRoss	Surface Water Ecosystem Impact Assessment
Jenna Lavin of Cedar Tower Solutions (CTS)	Heritage (incl. Archaeology and Palaeontology)
Molatela Ledwaba of Savannah Environmental ; external audit Tony Barbour	Social impact Assessment
Iris Wink of iWink Consulting	Traffic Impact Assessment
Lourens du Plessis t/a LOGIS	Visual Impact Assessment

The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having been involved in BA processes for more than fifteen (15) years. They have managed and drafted Environmental Management Programmes for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

## CHAPTER 5: ROLES AND RESPONSIBILITIES

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

For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- » Developer;
- » Project Manager/Site Manager;
- » Environmental Control Officer;
- » Contractors; and
- » Contractor's Safety, Health and Environment Representative/Environmental Officer.

It is acknowledged that the specific titles for these functions may vary once the project is implemented. The purpose of this section of the EMPr is to give a generic outline of what these roles typically entail. It is expected that this will be further defined during project implementation.

#### **i) The Developer**

As the Applicant/proponent, South Africa Mainstream Renewable Power Developments (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations and all other permits, and obligations emanating from other relevant environmental legislation.

#### **ii) Project Manager/Site Manager**

The Project Manager/Site Manager is responsible for overall management of project and EMPr implementation. The following tasks will fall within his/her responsibilities:

- » Be fully conversant with the BA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
- » Be fully knowledgeable with the contents of all relevant licences and permits.
- » Be familiar with the recommendations and mitigation measures of this EMPr and implement these measures.
- » 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.
- » Monitor site activities on a daily basis for compliance.
- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This must be documented as part of the site meeting minutes.
- » Conduct internal audits of the construction site against the EMPr.
- » Confine the construction site to the demarcated area.
- » Rectify transgressions through the implementation of corrective action.

### **iii) Environmental Control Officer**

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

- » Be fully knowledgeable of the contents of the BA.
- » Be fully knowledgeable of the contents of the conditions of the EA (once issued).
- » Be fully knowledgeable of the contents of the EMPr.
- » Be fully knowledgeable of all the licences and permits issued to the site.
- » Be fully knowledgeable of the contents of all relevant environmental legislation.
- » Ensure that the contents of the EMPr are communicated to the Contractors site staff and that the Site Manager and Contractors are constantly made aware of the contents through ongoing discussion.
- » Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements or site-specific plans.
- » Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing).
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Independently report to the GDARD in terms of compliance with the specifications of the EMPr and conditions of the EA (once issued).
- » Keep records of all reports submitted to GDARD.

The ECO must be present full-time on site for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, to facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter, monthly compliance audits can be undertaken, provided that adequate compliance with the EA, environmental permits and EMPr is achieved. The developer should appoint a designated Environmental Officer (EO) to be present on-site to deal with any environmental issues as they 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.

An environmental control officer (ECO) inspection of the project area/development footprint and surrounding influenced areas must be completed during construction and within 1 month following the end of construction activities and within a week after the first rainfall event. Thereafter, routine monitoring should take place for the life of the project. Should erosion be developing this must be immediately addressed through appropriate and adaptive measures

### **iv) Contractors**

The Lead Contractor is responsible for the following:

- » Ensure compliance with the EA, environmental permits and the EMPr at all times during construction.
- » Have the overall responsibility of the EMPr and its implementation.
- » Ensure that all appointed contractors and sub-contractors are aware of the EMPr and their respective responsibilities.
- » Provide all necessary supervision during the execution of the project.
- » Comply with any special conditions as stipulated by landowners.
- » Inform and educate all employees about the environmental risks associated with the various activities to be undertaken, and highlight those activities which should be avoided during the construction process in order to minimise significant impacts to the environment.
- » Maintain an environmental register which keeps a record of all incidents which occur on the site during construction. These incidents include:
  - \* Public involvement / complaints
  - \* Health and safety incidents
  - \* Hazardous materials stored on site
  - \* Non-compliance incidents
  - \* 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.
- » Where construction activities are undertaken is close to any inhabited area, the necessary precautions shall be taken by the Contractor to safeguard the lives and property of the inhabitants.
- » Conduct audits to ensure compliance to the EMPr.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Should the Contractor require clarity on any aspect of the EMPr the Contractor must contact the Environmental Consultant/Officer for advice.

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

- » 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 solar energy 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 Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken



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

**v) Contractor's Safety, Health and Environment Representative/Environmental Officer**

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

The Contractor's SHE/EO should:

- » Be well versed in environmental matters.
- » Understand the relevant environmental legislation and processes.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- » Know the background of the project and understand the implementation programme.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- » Keep accurate and detailed records of all EMPr-related activities on site.

**OBJECTIVE 2: Establish clear reporting, communication, and responsibilities during operation in relation to overall implementation of the EMPr during operation**

Formal responsibilities are necessary to ensure that key procedures are executed during operation. Several professionals will form part of the operation team. For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- » Operations Manager; and
- » Environmental Manager

It is acknowledged that the specific titles for these functions may vary once the project is implemented. The purpose of this section of the EMPr is to give a generic outline of what these roles typically entail. It is expected that this will be further defined during project implementation.

**i) Operations Manager**

The Operations Manager will:

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

## **ii) Environmental Manager**

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 solar energy 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 and conservation authorities) 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.

The Environmental Manager must provide fourteen (14) days written notification to the GDARD of when Quantum 1 SEF operation phase will commence.

## CHAPTER 6: MANAGEMENT PROGRAMME: PLANNING AND DESIGN

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

- » Ensures that the design of the solar energy 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 identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where applicable).
- » Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.
- » Ensures that the best environmental options are selected for the solar energy facility.

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

### 6.1. Objectives

**OBJECTIVE 1: To ensure that the design of the facility responds to the identified environmental constraints and opportunities**

If accepted by the GDARD, proposed development footprint detailed in **Figure 2.2**, must be implemented. Cognisance of sensitive areas that have been detailed within the BA Report should be considered when undertaking the final design of the facility.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Design fails to respond optimally to the identified environmental considerations.</li> <li>» Employment creation for the construction, operation and decommissioning activities.</li> <li>» Design fails to respond optimally to the environmental considerations.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Positioning of PV arrays and alignment of access roads and underground cabling where feasible.</li> <li>» Positioning of onsite substation.</li> <li>» Positioning of laydown areas.</li> <li>» Pre-construction activities, e.g. geotechnical investigations.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the design of the solar facility responds to the identified environmental constraints and opportunities, including the constraints identified through the BA process.</li> </ul>

- » To ensure that pre-construction activities are undertaken in an environmentally friendly manner by e.g. avoiding identified sensitive areas and the avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems
- » Optimal planning of visual infrastructure to minimise visual impact.

Mitigation: Action/control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally responsible manner and in a manner that does not lead to unnecessary impacts and disturbance.	Developer Contractor	Design phase Pre-Construction
Consider design level mitigation measures recommended by the specialists, as detailed within the BA report and relevant appendices.	Developer Contractor	Design phase
Compile and implement a rehabilitation plan from the onset of the project.	Developer Contractor	Design phase Construction
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Developer	Design phase
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Developer Contractor	Design phase
Do not clear areas of indigenous vegetation outside of the direct project footprint	Developer Contractor	Design phase
Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised.	Developer Contractor	Design phase
Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.	Developer	Design phase
Minimise the development footprint and vegetation clearing as far as possible.	Developer	Design phase
Appropriate design of roads and other infrastructure to minimise faunal impacts and allow fauna to pass over, through or underneath these features as appropriate.	Developer Contractor	Design phase Construction
A stormwater management plan must be developed for the project. The stormwater management plan must detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems, and provide recommendations on inspection frequency and effective mitigation measures.	Developer Contractor	Design phase
Use mobile batching plants and quarries in close proximity to the site.	Developer Contractor	Design phase Construction
Before construction commences individuals of listed species within the development footprint that would be affected, should be counted and marked and translocated where deemed necessary by the ecologist conducting the pre-construction walk-through survey, and according to the recommended ratios.	Contractor Specialist	Pre-construction
Outside lighting should be designed and limited to minimize impacts on fauna.	Project manager, Environmental Officer	Design phase Construction
All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any	Developer	Design phase Construction

Mitigation: Action/control	Responsibility	Timeframe
energy in the water which may pose an erosion risk. Energy dissipation, such as stone berms or blocks must be strategically placed along the road margins as surface runoff leaves the roads and enters the surrounding environment with the potential for severe erosion and damage to road margins. The steeper the slope of the road, the more regular the berms should be spaced and can be as close as one meter apart where necessary.		
No stormwater runoff must be allowed to discharge directly into demarcated drainage features. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments.	Contractor	Design phase Construction
Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used.	Developer	Design phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Design meets the objectives and does not degrade the environment.</li> <li>» Design and layouts respond to the mitigation measures and recommendations in the BA report.</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 BA report through review of the facility design by the Project Manager and ECO prior to the commencement of construction.</li> </ul>

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Obtain any additional environmental permits required prior to the commencement of construction.	Developer	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Obtain abnormal load permits for transportation of project components to site (if required).	Contractor(s)	Prior to construction
A detailed geotechnical investigation is required for the design phase for all infrastructure components.	Developer	Design phase
The necessary biodiversity permits must be obtained prior to removal of any Species of Conservation Concern (SCC).	Developer	Pre-construction
Undertake ecological preconstruction walk-through of the final development footprint to identify and locate protected species that would be affected and that can be translocated.	Developer Specialist	Pre-construction
Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the GDARD, and kept on site during the construction and operation phases of the project.	Developer	Design phase
Search and rescue of species of conservation concern should be conducted prior to clearing activities.	Developer Contractor	Pre-construction
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities	Developer Contractor	Pre-construction
Implement an alien invasive management plan and open space management plan for the site (refer to <b>Appendix C</b> ).	Developer Contractor/Service Provider	Pre-construction
Implement a plant rescue and protection plan for the site (refer to <b>Appendix E</b> ).	Developer Contractor/Service Provider	Pre-construction
Implement a re-vegetation and habitat rehabilitation plan for the site (refer to <b>Appendix D</b> ).	Developer Contractor/Service Provider	Pre-construction
Implement a traffic and transportation management plan for the site (refer to <b>Appendix F</b> ).	Developer Contractor/Service Provider	Pre-construction
Develop an effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	Developer Contractor/Service Provider	Pre-construction
Prepare a detailed Fire Management Plan in collaboration with surrounding landowners.	Developer	Pre-construction
A water use authorisation application must be submitted and obtained from the DWS prior to any abstraction of groundwater	Developer Contractor	Prior to water use

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Layout does not destroy/degrade no-go areas.</li> <li>» No disturbance of no-go areas.</li> <li>» Permits are obtained and relevant conditions complied with.</li> <li>» Relevant management plans and Method Statements prepared and implemented.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Review of the design by the Project Manager and the ECO prior to the commencement of construction.</li> <li>» Monitor ongoing compliance with the EMPr.</li> </ul>

**OBJECTIVE 3: Ensure compliance of required mitigation measures and recommendations by contractors**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact on identified sensitive areas.</li> <li>» Planning fails to respond optimally to the environmental considerations.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Positioning of all project components</li> <li>» Pre-construction activities.</li> <li>» Positioning of temporary sites.</li> <li>» Employment and procurement procedures.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that appropriate planning is undertaken by the contractor to ensure compliance with the conditions of the EA and EMPr.</li> <li>» To ensure that pre-construction and construction activities are undertaken in an environmentally friendly manner.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Developer Contractor	Pre-construction
Create awareness of skills through posters and media announcements and set-up a skills desk at a central and accessible location. The skills desk should serve to record local job seeker skills.	Developer Contractor	Pre-construction
Develop a local community safety forum to establish monitoring methods for the surrounding community.	Developer Contractor	Pre-construction
The developer should encourage the Contractor to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies.	Developer Contractor	Pre-construction
The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers were feasible.	Developer Contractor	Pre-construction
Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas and demarcating sensitive areas, etc.	Developer Contractor	Pre-construction
The Developer should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be	Developer Contractor	Design phase Construction

Mitigation: Action/Control	Responsibility	Timeframe
signed between the Developer, the Contractors, and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities.		
The Developer and Contractor should develop a Code of Conduct for construction workers. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The Code of Conduct should be signed by the Developer and the Contractors before the contractors move onto site. The Code of Conduct should form part of the Community Health, Safety and Security Plan.	Developer Contractor	Design phase Construction
A Method Statement must be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Conditions of the EA and EMPr form part of all contracts.</li> <li>» Local employment and procurement is encouraged.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Monitor ongoing compliance with the EMPr and method statements.</li> </ul>

**OBJECTIVE 4: To ensure effective communication mechanisms**

It is important to maintain on-going communication with the public (including affected and surrounding landowners) during the construction and operation phases of the Quantum 1 SEF. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

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



Mitigation: Action/control	Responsibility	Timeframe
Develop and implement a grievance mechanism for the construction, operation and closure phases of the solar energy facility for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer Contractor O&M Operator	Pre-construction (construction procedure) Pre-operation (operation procedure)
Meet with the affected owners and discuss their concerns over property and land values, as well as educate and inform them on the potential environmental impacts that could ensue.	Developer	Pre-construction
Develop an incident reporting system to record non-conformances to the EMPr.	Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)

<b>Performance Indicator</b>	» Effective communication procedures in place for all phases as required.
<b>Monitoring</b>	» An incident reporting system used to record non-conformances to the EMPr. » Grievance mechanism procedures implemented. » Public complaints register developed and maintained.

## OBJECTIVE 5: Minimisation of visual impacts associated with Planning

<b>Project component/s</b>	» PV arrays; » Substation; » BESS; » Access roads; and » Associated infrastructure.
<b>Potential Impact</b>	» Primary visual impact of the facility due to the presence of the PV panels and associated 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 1km of the site) as well as within the region.
<b>Mitigation: Target/Objective</b>	» Optimal planning of infrastructure to minimise the visual impact.

Mitigation: Action/control	Responsibility	Timeframe
Use anti-reflective panels and dull polishing on structures where possible and industry standard.	Project proponent / contractor	Early in the planning phase.
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Project proponent / contractor	Early in the planning phase.
Retain and maintain natural vegetation (if present) immediately adjacent to the development footprint.	Project proponent/ design consultant	Early in the planning phase.

Mitigation: Action/control	Responsibility	Timeframe
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Project proponent/ design consultant	Early in the planning phase.
Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised.  Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.	Project proponent/ 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 PV Facility and the ancillary infrastructure. The following is recommended: <ul style="list-style-type: none"> <li>o Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).</li> <li>o Limit mounting heights of fixtures, or use foot-lights or bollard lights.</li> <li>o Make use of minimum lumen or wattage in fixtures.</li> <li>o Making use of down-lighters or shielded fixtures.</li> <li>o Make use of Low-Pressure Sodium lighting or other low impact lighting.</li> </ul> Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes.	Project proponent/ design consultant	Early in the planning phase.

<b>Performance Indicator</b>	» Minimal exposure (limited or no complaints from I&APs) of ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 3km) and within the region.
<b>Monitoring</b>	» Monitor the resolution of complaints on an ongoing basis (i.e. during all phases of the project).

## CHAPTER 7: MANAGEMENT PROGRAMME: CONSTRUCTION

**Overall Goal:** Undertake the Construction 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 the indigenous natural vegetation, protected tree species, and habitats of ecological value.
- » Minimises impacts on fauna using the site.
- » Minimises the impact on heritage sites should they be uncovered.
- » Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

An environmental baseline must be established during the undertaking of construction activities, where possible.

### 7.1. Objectives

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

#### OBJECTIVE 1: Securing the site and site establishment

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Hazards to landowners and public.</li> <li>» Security of materials.</li> <li>» Substantially increased damage to natural vegetation.</li> <li>» Potential impact on fauna and avifauna habitat.</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 employees, vehicles and plant equipment in the area and on-site.</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> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Areas should be cleared and disturbed on a needs basis only, as opposed to clearing and disturbing a number of sites simultaneously, where feasible	Contractor	Construction
Vegetation clearance must be restricted to the authorised footprint. The area to be cleared should be walked on foot by 1-2 individuals to create a disturbance in order for fauna to move off. Sites should be disturbed only prior to the area having to be cleared, not more than 1 day in advance.	Contractor	Construction
Demarcate work areas during the construction period to avoid affecting any outside areas. Both sensitive and construction areas must be clearly demarcated. No activities should be allowed in the sensitive areas. Use physical barriers e.g., safety tape, not painted lines, and use signage. However, caution should be exercised to avoid using material that might entangle fauna.	Developer Contractor	Design phase Construction
Vegetation clearing commences only after the necessary permits have been obtained, if the protected trees cannot be avoided.	Developer Contractor	Construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site. These must be situated outside of any delineated drainage features or the buffers shown.	Contractor	During site establishment and during construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at sites where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction
No unauthorized persons should be allowed onto the site and site access should be strictly controlled	Contractor	Construction
Removal of obstacles to allow for access of construction must be kept to only where essential.	Contractor	Construction
Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint/servitude	Developer	Construction
Secure the site, working areas and excavations in an appropriate manner. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.	Contractor EO	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 indigenous languages, all to the approval of the Site Manager. All unattended open excavations shall be adequately demarcated and/or fenced.	Contractor	During site establishment Maintenance: for duration of Contract

Mitigation: Action/control	Responsibility	Timeframe
Where necessary to control access, fence and secure the area and implement access control procedures.	Contractor	During site establishment Maintenance: for duration of Contract
Establish SABS 089: 1999 Part 1 approved bunded areas for the storage of hazardous materials and hazardous waste.	Contractor	During site establishment and during construction

<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 as a result of construction activities.</li> <li>» Fauna and flora are protected as far as practically possible.</li> <li>» Appropriate and adequate waste management and sanitation facilities provided at construction site.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular visual inspection of the fence for signs of deterioration/forced access.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» Public complaints register must be developed and maintained on site.</li> <li>» EO to monitor all construction areas on a continuous basis until all construction is completed; immediate reporting back to the site manager.</li> <li>» EO to address any infringements with responsible contractors as soon as these are recorded.</li> </ul>

**OBJECTIVE 2: Appropriate management of the construction site and construction workers**

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

Mitigation: Action/Control	Responsibility	Timeframe
All personnel and contractors to undergo Environmental Awareness Training to all personnel and contractors. A signed register of attendance must be kept for proof.	Developer Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site	Contractor	Construction
To minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the BA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.	Contractor	Construction
Contractors must ensure that all workers are informed at the outset of the construction of the conditions contained on the Code of Conduct.	Contractor and sub-contractor/s	Pre-construction
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads where possible.	Contractor	Construction
Appropriate speed control measures and signs must be erected.	Developer Contractor	Construction Operation
Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills. This must take place off site. Drip trays must be provided for when these works are undertaken.	Contractor	Construction
Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint;	Contractor	Construction
Ensure proper health and safety plans in place during the construction period to ensure safety on and around site during construction	H&S Officer	Pre-construction
Ensure that construction workers are clearly identifiable. All workers must carry employee identification cards and wear identifiable clothing.	Contractor	Construction
Regular toolbox talks should be undertaken to ensure appropriate levels of environmental awareness.	Contractor	Construction
Contact details of emergency services must be prominently displayed on site.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Personnel trained in first aid must be on site to deal with smaller incidents that require medical attention.	Contractor	Construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan must be developed with emergency procedures in the event of a fire.	Contractor	Construction
Strict control of the behaviour of construction workers must be implemented in terms of works near marked drainage areas.	Contractor	Construction
Where possible, existing access routes and walking paths must be made use of.	Developer Contractor	Design phase Construction

Mitigation: Action/Control	Responsibility	Timeframe
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Construction
No domestic and other waste must be left at the site and must be transported to a suitably licenced waste facility/area.	Contractor	Construction
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at a suitably licensed waste facility.	Contractor	Duration of Contract
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Contractor	Construction
All contaminated water must be contained by means of careful run-off management on site. Where required, the contaminated water must be treated, or removed from the natural ground immediately, to prevent infiltration and possible further environmental degradation.	Contractor	Construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	Construction
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly, and associated waste disposed of at a registered/permitted waste disposal site. The disposal slips to be filed and kept on site and provided to the ECO on request. Ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Construction
Cooking and eating of meals must take place in a designated area. No open fires made by the construction teams are allowed during the construction phase.	Contractor and sub-contractor/s	Construction
All litter must be deposited in a clearly marked, closed, animal- and weatherproof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Construction
The strict use and management of all hazardous materials used on site should be practiced. A record of all hazardous substances stored on site must be kept. Clearly label all the containers storing hazardous waste.	Contractor	Construction
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill, immediately.	Contractor	Construction
Ensure proper health and safety plans in place during the construction period to ensure safety on and around site during construction, including fencing of the property and site access restriction.	Contractor and sub-contractor/s	Pre-construction
All disturbed areas that are not used such as excess road widths, should be rehabilitated with locally occurring shrubs and grasses	Contractor and sub-contractor/s	Post-Construction

Mitigation: Action/Control	Responsibility	Timeframe
after construction to reduce the overall footprint of the development.		
On completion of the construction, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Post - Construction
Removal of obstacles to allow for access of construction vehicles must be kept to only where essential.	Contractor and sub-contractor/s	Construction
Prior arrangements must be made with the landowner and neighbouring landowners to ensure that farm animals are moved to areas where they cannot be injured by vehicles traversing the area.	Contractor and sub-contractor/s	Construction
No boundary fence must be opened without the landowner or neighbouring landowners' permission	Contractor and sub-contractor/s	Construction
Where possible, conduct the construction activities outside of the rainy season. If not, a method statement may be required to ensure works during the wet season will not have any impact on the environment and ensure that the impact significance in the EIA Report remains unchanged.	Contractor and sub-contractor/s	Construction
Vehicles and equipment must park in designated parking areas, and where applicable, drip trays placed beneath the vehicles and/or equipment.	Contractor and sub-contractor/s	Construction
All contractors must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.	Contractor	Pre-construction/ Construction
All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping"	Environmental Officer (EO)/Contractor ECO	Construction
All contractors must have spill kits available and be trained in the correct use thereof.	Contractor ECO	Construction
contaminants should be undertaken in bunded areas	Contractor ECO	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement.</li> <li>» All areas are rehabilitated promptly after construction in an area is complete.</li> <li>» Excess vegetation clearing and levelling is not undertaken.</li> <li>» No complaints regarding contractor behaviour or habits.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular audits of the construction camps and areas of construction on site by the EO.</li> <li>» Proof of disposal of sewage at an appropriate licensed wastewater treatment works.</li> <li>» Proof of disposal of waste at an appropriate licensed waste disposal facility.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» Observation and supervision of Contractor practices throughout the Construction by the EO.</li> <li>» Complaints will be investigated and, if appropriate, acted upon.</li> </ul>



**OBJECTIVE 3: Maximise local employment and business opportunities associated with the Construction**

It is acknowledged that skilled personnel are required for the construction of the solar facility and associated infrastructure. However, where semi-skilled and unskilled labour may be used required, opportunities for local employment should be maximised as far as possible. Employment of locals and the involvement of local Small, Micro and Medium Enterprises (SMMEs) would enhance the social benefits associated with the solar energy facility, 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 activities associated with the establishment of the solar facility, including associated 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>	» The Developer, in discussions with the local municipality, should aim to employ as many workers (skilled, semi-skilled / low-skilled) from the local areas/ towns, as possible. » The Developer should also develop a database of local BBBEE service providers.

Mitigation: Action/control	Responsibility	Timeframe
Where reasonable and practical, the Developer is encouraged to appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.	Contractor	Construction
Enhance employment opportunities for the immediate local area, i.e., Khāi-Ma Local Municipality. If this is not possible, then the broader focus areas should be considered for sourcing workers.	Contractor	Construction
The recruitment selection process must seek to promote gender equality, and consideration must be given to women during the process.	Contractor	Construction
Before the Construction commences the Developer should meet with representatives from the district and local municipalities to establish the existence of a skills database for the area. If such a database exists, it should be made available to the contractors appointed for the Construction.	Contractor	Construction
Train unemployed local community members with insufficient skills and increase absorption of local labour thereby decreasing in-migration.	Contractor	Construction
In order to maximise the positive impact, the project company should provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
It is recommended that realistic local recruitment targets be set for the construction phase.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Maximum amount of semi and unskilled labour locally sourced where possible.</li> <li>» Local suppliers and SMMEs contracted where possible.</li> <li>» Skills transfer facilitated where required.</li> <li>» Apprenticeship programmes established</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Contractors and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> </ul>

**OBJECTIVE 4: Avoid the negative social impacts on family structures and social networks due to the presence of construction workers from outside the area**

The migration of people to the area could result in social conflicts between the local population and the migrant work force as the local population could perceive these migrant workers as “stealing” their employment opportunities. Likewise, the influx of people into the area, could potentially lead to a temporary increase in the level of crime, illicit activity and possibly a deterioration of the health of the local community through the spread of infectious diseases. Without any form of income these individuals run the risk of exacerbating the level of poverty within the area. Aside from the broader community issues the increase in the number of people in the area is likely to have an adverse effect on crime levels, incidents of trespassing, development of informal trading and littering. There is also potentially a likelihood of increased stock theft.

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>	<ul style="list-style-type: none"> <li>» Construction and establishment activities associated with the establishment of the solar energy facility, including associated infrastructure.</li> <li>» Construction work force.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» 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.</li> <li>» Presence of construction workers on site may result in loss of livestock due to stock theft and damage to farm infrastructure, such as gates and fences. Poaching of wild animals may also occur.</li> <li>» Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities.</li> <li>» Impact on the safety of farmers and communities (increased crime etc.) by construction workers and also damage to farm infrastructure such as gates and fences.</li> <li>» Increase in production and GDP-R.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.</li> <li>» The presence of construction workers on the site can result in stock thefts or illegal hunting/trapping of fauna and or game and damage to farm infrastructure.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Avoid and/or minimise the potential impact of construction workers on the local community and their livelihoods.</li> </ul>

- » To minimise impacts on the social and biophysical environment.
- » Maximise the economic benefit to the local municipality.
- » Prohibit theft of stock and valuables on impacted and adjacent farm portions.
- » Procure goods and services, as far as practically possible, from the local municipality.
- » Initiate site access control and monitor movement to and from the site.

Mitigation: Action/control	Responsibility	Timeframe
The movement of construction workers should be limited to the vicinity of the site. Create and implement a local procurement policy that prioritizes "locals first" to prevent people from migrating to the area in search of work.	Contractor	Construction
Transportation for the construction workers need to be arranged by the contractor to ensure that there will be no trespassing of properties by any staff. Necessary arrangements to enable workers to return to their hometowns over weekends should also be arranged in order to reduce the risks posed to local family structures and social networks.	Contractor	Construction
Contractors need to ensure that all workers sign a Code of Conduct during construction which are drawn up in accordance with the South African labour legislation. By doing this, workers will be legally informed of the associated risks on the property and that they would be held liable for any damages or losses. Any form of theft, damaged infrastructure and trespassing will lead to immediate dismissal and the workers would be held liable for the costs thereof.	Contractor	Construction
Awareness programmes for HIV/AIDS should be implemented for the construction workers	Contractor	Construction
In collaboration with the municipality and local community leaders, create and implement a recruitment protocol. Make certain that the procedures for applying for jobs are clearly communicated.	Contractor	Construction
Provide workers with transportation ( ) so that they can easily access their place of employment and do not need to relocate closer to the site.	Contractor	Construction
Prevent the recruitment of workers at the site.	Contractor	Construction
Create and implement a grievance procedure.	Contractor	Construction
Appoint a Community Liaison Officer (CLO) to assist with local labour procurement.	Contractor	Construction
Implement a method of communication in which procedures for lodging complaints are laid out so that the local community can express any complaints or grievances about the construction process.	Contractor	Construction
Establish clear access rules and regulations for the proposed site.	Contractor	Construction
Appoint a security company and put in place appropriate security procedures to ensure that employees do not remain on the premises after working hours.	Contractor	Construction
Inform local community organizations and law enforcement forums about construction activities, times, and duration.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
During the construction phase, working hours should ideally be limited to daylight hours. Where a change in working hours is required, the relevant authorities must approve it, and surrounding landowners must be notified. Records of the communication and approval of change in working hours must be filed and kept on site.	Contractor	Construction
All vehicles must be roadworthy, and drivers must be licensed, follow traffic rules, adhere to speed limits, and be made aware of potential road safety issues. The Engineering, procurement, and construction (EPC) contractor should inspect construction vehicles on a regular basis to ensure their roadworthiness. Proof of roadworthiness and licences to be kept on file on site.	Contractor	Construction
For the duration of the construction period, it is necessary to establish traffic warning signs and control measures that are adequate and strategically located along the N14 and gravel access roads. At all times, but especially at night, warning signals must be seen.	Contractor	Construction
Ongoing communication with landowners and road users during construction period.	Contractor	Construction
Before construction begins, hold informational seminars to ensure that the nearby communities are fully informed about the project that will be produced in its finished form. This needs to be done via the Community Liaison Officer (CLO).	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No criminal activities attributable to the construction workers are reported.</li> <li>» No complaints received from landowners or the general public.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

**OBJECTIVE 5: Management of dust and emissions and damage to roads**

During the construction phase, limited gaseous or particulate emissions (and dust) is anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the internal access roads.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Dust impacts can occur from cleared areas and from vehicle movement along gravel roads.</li> <li>» Release of minor amounts of air pollutants (for example NO<sub>2</sub>, CO and SO<sub>2</sub>) from vehicles and construction equipment.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» The movement of construction vehicles and their activities on the site.</li> <li>» Clearing of vegetation and topsoil.</li> </ul>

	<ul style="list-style-type: none"> <li>» Excavation, grading and scraping.</li> <li>» Transport of materials, equipment and components.</li> <li>» Re-entrainment of deposited dust by vehicle movements.</li> <li>» Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces.</li> <li>» Fuel burning from construction vehicles with combustion engines.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To avoid and or minimise the potential dust impacts associated with heavy vehicles, and also minimise damage to roads.</li> <li>» To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase.</li> <li>» To minimise nuisance to the community and adjacent landowners from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Reduce the dust generated by operational vehicles and earth moving machinery, through wetting the soil surface (with "dirty water") and putting up signs to enforce speed limits to enforce reduced speeds.	Contractor Developer	Construction
No non-environmentally friendly dust suppressants may be used as this could result in pollution of water sources.	Contractor Developer	Construction
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and bare (unvegetated) ground. The ECO should be approached in this regard to assist with possible mitigation measures.	Contractor	Construction
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Construction
Regular maintenance of gravel roads by the Contractor during construction.	Contractor	Construction
Ensure that damage to gravel public roads and access roads attributable to construction vehicles is repaired before completion of the construction phase. Images of roads prior to the commencement of construction should be taken and kept for comparison after the construction works have been completed to identify roads that may need to be rehabilitated or repaired once construction has been completed.	Contractor	Before completion of construction phase
Vehicles used to transport sand and building materials must be fitted with tarpaulins or covers when travelling on roads.	Contractor	Construction
Disturbed areas must be re-vegetated as soon as practicable after construction is complete in an area.	Contractor	At completion of the Construction
A drift fence must be erected to impede dust pollution into surrounding habitats	Contractor	Construction
The delineated drainage/riparian areas and are considered no go areas for any infrastructure associated with the proposed development. The recommended buffer zones must be strictly adhered to during the construction phase of the project, with exception of any authorised activities and structures required to traverse an aquatic resource. Any supporting aspects and	Project manager, Environmental Officer	Construction

Mitigation: Action/control	Responsibility	Timeframe
activities not required to be within the buffer area must adhere to the buffer zone;		
Demarcate work areas during the construction phase to avoid affecting outside areas. Both sensitive and construction areas must be clearly demarcated. No activities should be allowed in the sensitive areas. Use physical barriers e.g., safety tape, not painted lines, and use signage	Project manager, Environmental Officer	Construction
Where possible, existing access routes and walking paths must be made use of.	Project manager, Environmental Officer	Construction
Do not clear areas of indigenous vegetation outside of the direct project footprint	Project manager, Environmental Officer	Construction
Minimise vegetation clearing to the minimum required	Project manager, Environmental Officer	Construction
Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site	Project manager, Environmental Officer	Construction
Compile and implement a rehabilitation plan from the onset of the project;	Project manager, Environmental Officer	Construction
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and bare (unvegetated) areas. o Reduce the dust generated by operational vehicles and earth moving machinery, through wetting the soil surface (with "dirty water") and putting up signs to enforce speed limits to enforce reduced speeds. o No non-environmentally friendly suppressants may be used as this could result in pollution of water sources.	Project manager, Environmental Officer	Construction
Rehabilitate areas as soon as they are no longer impacted by construction o The rehabilitated areas must be revegetated with indigenous vegetation	Project manager, Environmental Officer	Construction
Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other others in need of stabilisation and vegetation cover	Project manager, Environmental Officer	Construction
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Project manager, Environmental Officer	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Appropriate dust suppression measures implemented on site during the Construction.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed or before entering the site.</li> <li>» Road worthy certificates in place for all heavy vehicles at the outset of the Construction and updated on a monthly basis.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» The Developer and appointed EO must monitor indicators listed above to ensure that they have been met for the Construction.</li> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

**OBJECTIVE 6: Conservation of the existing soil resource within the site and in the adjacent areas**

The natural soil on the site needs to be preserved as far as possible to minimise impacts on the environment. Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern. Uncontrolled run-off relating to construction activities (excessive wetting, etc.) will also lead to accelerated erosion. Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems.

A set of strictly adhered to mitigation measures are required to be implemented in order to effectively limit the impact on the environment. The disturbed areas where human impact is likely are the focus of the mitigation measures laid out below.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure..</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Erosion and soil loss.</li> <li>» Increased runoff.</li> <li>» Downstream sedimentation.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Rainfall and wind erosion of disturbed areas.</li> <li>» Excavation, stockpiling and compaction of soil.</li> <li>» Concentrated discharge of water from construction activity.</li> <li>» Stormwater run-off from sealed surfaces.</li> <li>» Mobile construction equipment movement on site.</li> <li>» Roadside drainage ditches.</li> <li>» Project related infrastructure, such as buildings, solar panels and fences..</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise erosion of soil from site during construction.</li> <li>» To minimise damage to vegetation by erosion or deposition.</li> <li>» To retain all topsoil with a stable soil surface</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Rehabilitate areas as soon as they are no longer impacted by construction. The rehabilitated areas must be revegetated with indigenous vegetation.	Developer Contractor	Construction
Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other others in need of stabilisation and vegetation cover.	Developer Contractor	Construction
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion.	Developer Contractor	Construction
ECO to provide supervision and oversight of vegetation clearing activities.	Developer Contractor ECO	Construction

Mitigation: Action/control	Responsibility	Timeframe
Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks. Drip trays to be available for all equipment and plants that will stand overnight on site.	Contractor	Construction
Any erosion problems observed along access roads or any hardened/engineered surface should be rectified immediately and monitored thereafter to ensure that they do not re-occur.	Contractor	Construction
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. Wherever excavation is necessary, topsoil should be set aside and all bare areas replaced to encourage natural regeneration of the local indigenous species. Stockpiles may not exceed 2m.	Contractor	Construction
Spillages of cement to be cleaned up immediately and disposed or re-used in the construction process.	Contractor	Construction
Sufficient and suitable spill kits to be kept on active parts of the construction site and at site offices. Sufficient and suitable spill kits must be kept on site.	Contractor	Construction
Cement batching (if relevant) to take place in designated areas only, as approved on site layout (if applicable). Any batching should not be undertaken on the natural ground.	Contractor	Construction
When preparing the hard setting area, cuts should be used for fill with little or no wastages.	Contractor	Construction
Implement erosion control measures for denuded areas as required and monitor erosion and manage all occurrences according to the erosion management plan (refer to <b>Appendix G</b> ). Erosion control measures should be implemented in areas where slopes have been disturbed.	Contractor	Construction
Control depth of all excavations and stability of cut faces/sidewalls.	Contractor	Construction
Re-applied topsoil needs to be re-vegetated as soon as possible. Reapplying topsoil: <ul style="list-style-type: none"> <li>» Spoil materials and subsoil must be back-filled first, then covered with topsoil.</li> <li>» Immediate replacement of topsoil after the undertaking of construction activities within an area.</li> <li>» Generally, topsoil should be re-applied to a depth slightly greater than the topsoil horizon of a pre-selected undisturbed reference site.</li> <li>» The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm.</li> <li>» If the amount of topsoil available is limited, a strategy must be devised to optimise re-vegetation efforts with the topsoil available.</li> <li>» Reapplied topsoil should be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture</li> </ul>	Contractor	Construction



Mitigation: Action/control	Responsibility	Timeframe
<p>levels where the seeds are likely to be more concentrated. This greatly improves the success rate of re-vegetation efforts.</p> <ul style="list-style-type: none"> <li>» To stabilise reapplied topsoil and minimise raindrop impact and erosion:                             <ul style="list-style-type: none"> <li>* Use organic material from cleared and shredded woody vegetation where possible</li> <li>* Alternatively, suitable geotextiles or organic erosion mats can be used as necessary</li> </ul> </li> <li>» Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation.</li> </ul>		
<p>Implement general erosion control measures/practises:</p> <ul style="list-style-type: none"> <li>» Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas.</li> <li>» Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water.</li> <li>» Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area.</li> <li>» Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction.</li> <li>» Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation.</li> <li>» Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then result in sedimentation.</li> <li>» When implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation.</li> </ul>	Contractor	Construction
<p>Conservation measures should be applied to ensure that soil does not get unusable or unproductive and to ensure soil stabilisation.</p>	Contractor	Construction
<p>Regular monitoring for erosion during construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.</p>	ECO	Construction
<p>Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas.</p>	Contractor	Construction
<p>Construction of gabions and other stabilisation features to prevent erosion must be undertaken, if deemed necessary.</p>	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface.	Contractor	Construction
Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).	Developer	Construction
Vegetate or cover all stockpiles after stripping/removing soils	Contractor ECO	Construction
Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the soil resources	Contractor ECO	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal level of soil erosion around site.</li> <li>» Minimal level of soil degradation.</li> <li>» No activity outside demarcated areas.</li> <li>» Progressive return of disturbed and rehabilitated areas to the desired end state.</li> <li>» No indications of visible topsoil loss.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Continual inspections of the site by the EO.</li> <li>» Reporting of ineffective sediment control systems and rectification as soon as possible.</li> <li>» If soil loss is suspected, acceleration of soil conservation and rehabilitation measures must be implemented.</li> </ul>

**OBJECTIVE 7: Minimise the impacts on and loss of indigenous vegetation, control of alien invasive plants and impact to freshwater resources**

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Loss of plant cover leading to loss of faunal habitat and loss of specimens of protected plants.</li> <li>» Soil erosion.</li> <li>» Indirect impacts on downslope freshwater resource features.</li> <li>» Increased fire hazards.</li> <li>» Increased water use.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and clearing.</li> <li>» Soil disturbance</li> <li>» Introduction of plant propagules with people and vehicles.</li> <li>» Activities outside of designated construction areas.</li> <li>» Driving off designated routes.</li> <li>» Indiscriminate destruction of habitat and/or disregard of areas delineated as being ecologically sensitive features.</li> </ul>

<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To limit construction activities to designated areas.</li> <li>» Implement invasive plant clearing prior to construction, but after site demarcation.</li> <li>» To negate the impacts to the present ecological state of the surface water ecosystems within the area in totality.</li> </ul>
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Mitigation: Action/control	Responsibility	Timeframe
There should be reduced activity at the site after large rainfall events when the soils are wet. No driving off of hardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.	Contractor	Construction
Compile and implement an alien vegetation management plan from the onset of construction. The plan must identify areas for action (if any) and prescribe the necessary removal methods and frequencies to be applied. This plan must also prescribe a monitoring plan and be updated as/when new data is collated;	Contractor (With input from the ECO, if necessary)	Pre-construction Construction
No fires should be allowed within the site.	Contractor	Construction
Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation.	Contractor	Construction Operation
No fuelwood collection should be allowed on-site.	Contractor	Construction
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. A method statement may be requested.	Contractor	Construction
Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. A method statement may be required.	Contractor	Construction
Materials and equipment must only be stored in the pre-determined laydown areas.	Contractor	Construction
Unnecessary impacts on surrounding natural vegetation must be avoided, The construction impacts must be contained to the footprint of the solar	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
energy facility and associated infrastructure.		
The delineated drainage/riparian areas are considered no go areas for any infrastructure associated with the proposed development. The recommended buffer zones must be strictly adhered to during the construction phase of the project, with exception of any authorised activities and structures required to traverse an aquatic resource. Any supporting aspects and activities not required to be within the buffer area must adhere to the buffer zone;	Contractor	Construction
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible once construction is complete in an area. » Do not import soil from areas with alien plants.	Contractor	Construction
Immediately control any alien plants that become established using registered control methods appropriate for the particular species in question. Where necessary, obtain an opinion from a registered Pest Control Officer.	Contractor	Construction
A registered Pest Control Officer, or suitably qualified individual/company must be appointed to implement the invasive alien plants and weeds management plan. The appointed service provider must supervise the clearing team to ensure compliance with the invasive alien plants and weeds management plan.	Contractor	Construction
Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.	Contractor	Construction
Containment of all contaminated water by means of careful run-off management on site.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Noise must be kept to a minimum from dusk to dawn to minimize all possible disturbances to amphibian species and nocturnal mammals	Contractor	Construction
No cleaning or servicing of vehicles, machines and equipment may be undertaken in water resources	Contractor ECO	Construction
Limit the extent of the vegetation stripping within the construction footprint to limit the impact of sedimentation of the surface water habitat units caused through erosion. The delineated area of the surface water ecosystems and associated conservation buffer zones must be regarded as out of bounds to contractors and equipment. Equipment and vehicles to be serviced and regularly inspected for fluid leaks to limit the impact of hydrocarbon contamination of soils and potential contamination of the surface waters. No dumping of any kind to take place within the delineated wetland zones and associated conservation buffers. If no viable alternative to herbicidal usage can be implemented, then herbicides must be applied according to manufacturer's guidelines, on quiet/windless/minimal windy days, and never during rain or when rainfall is forecast.	Contractor, Operations Manager & ECO	Ongoing throughout all phases of the proposed development activities.

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No disturbance outside of designated work areas.</li> <li>» Limited alien infestation within project control area.</li> <li>» Construction activities restricted to the development footprint.</li> <li>» Routine visual inspections to observe active sediment deposition and/or erosion formation.</li> <li>» Observations of unexplained die back of riparian/wetland vegetation.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing activities by ,the EO throughout the Construction.</li> <li>» Monitoring of alien plant establishment within the site on an on-going basis.</li> <li>» Recommended biennial (1x high season &amp; 1x low season) biomonitoring of the watercourse by a suitably qualified aquatic specialist who can assess the in-situ water quality, riparian vegetation, aquatic macro-invertebrates (SASS5 survey) and the fish species community structures against the baseline data. A report detailing the ecological trend analysis should be submitted upon completion of each survey period.</li> <li>» The report should also include an audit of the mitigation strategies in place to abate the impacts to the surface water ecosystems and provide measures and recommendations to improve on the processes (if applicable).</li> </ul>

**OBJECTIVE 8: Protection of terrestrial fauna**

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Vegetation clearance and associated impacts on faunal habitats.</li> <li>» Traffic to and from site.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Foundations or plant equipment installation.</li> <li>» Mobile construction equipment movement on site.</li> <li>» Access road construction activities.</li> <li>» Substation construction facilities.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise footprints of habitat destruction.</li> <li>» To minimise disturbance to resident and visitor faunal species.</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Minimise disturbance impact by reducing construction time, where possible.	Developer Contractor	Construction Operation
Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist.	Contractor	Construction
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.	Contractor	Construction
The timing between clearing of an area and subsequent development must be minimized to avoid fauna from re-entering the site to be disturbed.	Contractor	Construction
Considering that many of the mammal fauna recorded within the project area are nocturnal, construction activity should be avoided at night	Developer Contractor	Construction
Any holes/deep excavations must be done in a progressive manner on a needs basis only. No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. In the event holes/excavations are required to remain open overnight, these areas must be covered to prevent fauna falling into these areas and subsequently inspected prior to backfilling.	Developer Contractor	Construction
The EO must inspect holes/excavations each and every morning to ensure that fauna that may have fallen into the excavations are removed before the workers commence with construction activities.	EO Contractor	Construction
No animals may be killed on site. Those found guilty must be prosecuted. This must be made clear in environmental awareness training, and weekly toolbox talks.	EO Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Where possible, work should be restricted to one area at a time and be systematic. This is to reduce the number and extent of on-site activities, allowing fauna to move off as the Project progresses. This will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.	Contractor	Construction
The extent of clearing and disturbance to the vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Construction
During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.	Contractor ECO or other suitably qualified person	Construction
The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off of the construction site.	Contractor	Construction
Employees should be trained (e.g. during toolbox talks) that poisonous animals should not be killed and if encountered the ECO/ EO should be informed and the animal safely relocated.	Developer Contractor	Duration of contract
If any parts of the site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects, and which should be directed downwards.	Contractor	Construction
All construction vehicles should adhere to a low-speed limit to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.	Contractor	Construction Operation
If parts of the facility such as the substation are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside or guard wires or mesh can be placed outside of the fence to prevent tortoises from accessing the electrified fence.	Contractor	Construction
Any fauna (frogs, snakes, etc.) that are found within the construction area must be moved to the closest point of similar habitat type outside of the areas to be impacted.	Contractor	Duration of contraction
Generators used must have baffle boxes	Contractor	Construction
Poaching must be made a punishable offence and any incidences must be reported to the relevant conservation body.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No disturbance outside of designated work areas.</li> <li>» Minimised clearing of existing/natural vegetation and habitats for fauna.</li> <li>» Limited impacts on faunal species (i.e. noted/recorded fatalities), especially those of conservation concern.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing activities by the EO throughout Construction.</li> <li>» Supervision of all clearing and earthworks by the EO.</li> </ul>

## OBJECTIVE 9: Protection of avifauna

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance of birds (e.g. destruction of habitat).</li> <li>» Displacement of birds.</li> <li>» Collision with project components.</li> <li>» Traffic to and from site.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Foundations or plant equipment installation.</li> <li>» Mobile construction equipment movement on site.</li> <li>» Access road construction activities.</li> <li>» Substation construction facilities.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise footprints of habitat destruction.</li> <li>» To minimise disturbance to resident and visitor avifaunal species.</li> <li>» Prevent mortality of avifauna</li> <li>» Prevent displacement of avifauna</li> <li>» Prevention of electrocution mortality</li> <li>» Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMP).</li> <li>» Prevention of powerline collision mortality</li> <li>» Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented by an appropriately qualified rehabilitation specialist, according to the recommendations of the botanical specialist study.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Disturbance and clearing outside of the demarcated construction area must not be cleared or degraded or damaged through construction activities.	Contractor	Construction
Construction camps should be lit with as little light as practically possible, with the lights directed downwards where appropriate.	Contractor	Construction
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments or sensitive areas. Signs must be put up to enforce this.	Contractor EO	Construction
Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible, and in particular to the proposed road network. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.	Contractor	Construction
Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction.	Contractor	Construction



Mitigation: Action/control	Responsibility	Timeframe
Monitoring of <i>Calendulauda burra</i> (Red Lark) populations within the surrounding habitats must occur.	Specialist EO	Construction, Operational and Decommissioning Phases
A single perimeter fence should be used <sup>2</sup> .	Project Developer	Once-off during the planning phase.
Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible.	Project Developer	Once-off during the planning phase.
Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of solar priority species.	Project Developer	Once-off during the planning phase.
Measures to control noise and dust should be applied according to current best practice in the industry.	Project Developer	Once-off during the planning phase.
Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical	Project Developer	Once-off during the planning phase.
Design the facility with underground cables as much as possible.	Project Developer	Once-off during the planning phase.
A raptor -friendly pole design must be used, and the pole design must be approved by the avifaunal specialist.	Project Developer	Once-off during the planning phase.
No off-road driving;	Contractor and ECO	1. On a daily basis
Maximum use of existing roads, where possible;	Contractor and ECO	Monthly
Measures to control noise and dust according to latest best practice;	Contractor and ECO	Monthly
Restricted access to the rest of the property;	Contractor and ECO	Monthly
Strict application of all recommendations in the botanical specialist report pertaining to the limitation of the footprint.	Contractor and ECO	Monthly
Eskom approved bird flight diverters should be installed on the full span length of all 33kV overhead lines according to the applicable Eskom Engineering Instruction. These devices must be installed as soon as the conductors are strung.	Contractor and ECO	Once-off
Develop a Habitat Restoration Plan (HRP).	Project Developer	Once-off
Monitor rehabilitation via site audits and site inspections to ensure compliance.	Facility Environmental Manager	Once a year
Record and report any non-compliance.	Project Developer and Facility Operational Manager	As and when required

<sup>2</sup> If a fence is used consisting of an outer diamond mesh fence and inner electric fence with a separation distance of approximately 100 mm or less, it should not pose any risk of entrapment for large terrestrial species and can be considered a single fence.

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No disturbance outside of designated work areas.</li> <li>» Minimised clearing of existing/natural vegetation and habitats for avifauna.</li> <li>» Limited impacts on avifaunal species (i.e. noted/recorded fatalities), especially those of conservation concern.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing activities by the EO throughout Construction.</li> <li>» Supervision of all clearing and earthworks by the EO.</li> </ul>

**OBJECTIVE 10: Minimise impacts on heritage sites during the construction of the solar energy facility**

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Excavations of solar panel mounting structure foundations.</li> <li>» Excavations of trenches for the installation of cabling and infrastructure.</li> <li>» Excavation of substation foundations.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Loss of archaeological artefacts.</li> <li>» Loss of fossil resources.</li> <li>» Impacts on heritage sites.</li> <li>» Impacts on graves or burial sites.</li> <li>» Loss of resources going unnoticed.</li> <li>» Destruction of resources</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» All bulk earthworks.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To facilitate the likelihood of noticing heritage resources and ensure appropriate actions in terms of the relevant legislation</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
The Chance Fossil Finds Procedure ( <b>Appendix J</b> ) must be implemented for the duration of construction activities:	Contractor	Construction
Should any buried archaeological resources or human remain or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.	Contractor	Construction
The Environmental Control Officer (ECO) and Environmental Officer (EO) should be made aware of the possibility of important fossil remains (bones, teeth, fish, petrified wood, plant-rich horizons etc) being found or unearthed during the Construction of the development.	ECO EO	Construction
A 250m no development buffer should be implemented along the N14. The layout provided complies with this requirement.		
Specific engagement with the MA for the COHWHS should take place regarding development within the identified WHS bu□er		
The attached Chance Fossil Finds Procedure must be implemented for all excavation activities		
Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils,		

Mitigation: Action/control	Responsibility	Timeframe
burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.		

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Reporting of and liaison about possible finds of heritage resources.</li> <li>» Heritage resources noticed and rescued.</li> <li>» All heritage items located are dealt with as per the legislative guidelines.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Ensure staff are aware of heritage resources and the procedure to follow when found.</li> <li>» EO to conduct inspections of open excavations.</li> </ul>

**OBJECTIVE 11: Minimisation of visual impacts associated with construction**

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

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Construction site.</li> <li>» Transportation of staff and equipment.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and the resulting erosion.</li> <li>» Construction traffic.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» The viewing of visual scarring by observers in the vicinity of the solar facility or from the roads in the surrounding area.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimal disturbance to vegetation cover in close vicinity of the solar facility and its related infrastructure.</li> <li>» Minimised construction traffic, where possible.</li> <li>» Minimal visual intrusion by construction activities and intact vegetation cover outside of the immediate construction work areas.</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Use anti-reflective panels and dull polishing on structures where possible and industry standard.	Developer Contractor	Construction Operation
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting, where possible.	Developer Contractor	Construction
Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.	Contractor	Construction
Ensure that vegetation is not unnecessarily removed during the construction period.	Contractor	Construction
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works.	Contractor	Construction
Lighting fixtures should be fitted with baffles, hoods or louvres and directed downward. Outside lighting should be directed away from highly sensitive areas such as the wetlands. Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible;	Contractor	Construction
Ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during the construction phase, where possible.	Project proponent / contractor	Early in the construction phase.
Reduce the construction phase through careful logistical planning and productive implementation of resources wherever possible.	Project proponent / contractor	Early in the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Project proponent / contractor	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.	Project proponent / contractor	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).	Project proponent / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting, where possible.	Project proponent / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas (if present/if required) immediately after the completion of construction works.	Project proponent / contractor	Throughout and at the end of the construction phase.

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

## OBJECTIVE 12: Appropriate handling and management of waste

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

- » general solid waste
- » hazardous waste
- » inert waste (rock and soil)

» liquid waste (including grey water and sewage)

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

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
An integrated on-site Waste Management Plan must be developed and implemented to avoid impacts to surrounding habitats.	Developer Contractor	Construction Operation
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at an appropriately licensed landfill.	Contractor	Construction
Waste should be appropriately managed and disposed of.	Contractor	Construction
Construction method and materials must be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Construction
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises is placed, dumped or deposited on adjacent/surrounding properties.	Contractor	Construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Construction
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for separation and storage of waste streams (such as wood, metals, general refuse etc.), and collection of such waste for disposal or drop-off at a suitably licenced facility.	Contractor	Construction
An integrated on-site Waste Management Plan must be developed and implemented to avoid impacts to surrounding habitats.	Contractor	Construction
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Construction

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Uncontaminated waste must be removed at least weekly for disposal, if feasible; other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Construction
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled. This must be regularly removed and recycled (where possible) or disposed of at an appropriately licensed landfill site. The bunded area must hold 110% of the waste storage receptacle.	Contractor	Construction
Waste must be stored in accordance with the relevant legislative requirements.	Contractor	Construction
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works, or similar suitably licenced facility accepting such waste.	Contractor	Construction
All liquid wastes must be contained in appropriately sealed vessels/ponds within the footprint of the development and be disposed of at a designated waste management facility, and appropriately labelled.	Contractor	Construction
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be filed and kept on site and be made available for review at any time.	Contractor	Construction
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage. Daily inspection of all chemical toilets and septic tanks must be performed by environmental representatives on site with photographic evidence that must be stored (on file or on pc) .	Contractor	Construction
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste. Contractors may be liable to fines, and to be reported to authorities.	Contractor	Construction
Under no circumstances may waste be burnt or buried on site.	Contractor	Construction Operation
Litter generated by the construction crew must be collected in rubbish bins and disposed of weekly, or at an appropriate frequency, at registered waste disposal sites.	Contractor	Construction
Upon the completion of construction, the area must be cleared of all potentially polluting materials (including chemical toilets). Spoil stockpiles must also be removed and appropriately disposed of or the materials re-used for an appropriate purpose.	Contractor	Construction
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles and machinery, cement) within demarcated / bunded areas.	Contractor	Construction
Any waste generated during construction must be stored in designated containers and removed from the site by the construction teams.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Any left-over construction materials must be removed from the site.	Contractor	Post-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.</li> <li>» Waste collection will be monitored on a regular basis.</li> <li>» Waste documentation completed.</li> <li>» Proof of disposal of sewage at an appropriate wastewater treatment works.</li> <li>» A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon.</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr.</li> </ul>

**OBJECTIVE 13: Appropriate handling and storage of chemicals, hazardous substances**

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Strict use and management of all hazardous materials used on site must be undertaken.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Strict Management of potential sources of pollution (litter, hydrocarbons from vehicles & machinery, cement during construction etc.) must be undertaken within demarcated/bunded areas.	Contractor	Construction
Implement an emergency preparedness plan during the Construction.	Contractor	Construction
Any liquids stored on site, including fuels and lubricants, must be stored in accordance with applicable legislation.	Contractor	Construction
Spill kits must be made available on-site, especially in areas where spills are likely to occur, for the clean-up of spills and leaks of contaminants. These must be maintained regularly.	Contractor	Construction
Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard surfaces.	Contractor	Construction
Establish an appropriate Hazardous Stores and fuel storage area which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This must include but not be limited to: <ul style="list-style-type: none"> <li>» Designated area;</li> <li>» All applicable safety signage;</li> <li>» Firefighting equipment;</li> <li>» Enclosed by an impermeable bund as per the requirements of the relevant standards and any relevant by-laws;</li> <li>» Protected from the elements,</li> <li>» Lockable;</li> <li>» Ventilated; and</li> <li>» Has adequate capacity to contain 110% of the largest container contents.</li> </ul>	Contractor	Construction
The storage of flammable and combustible liquids such as oils must be stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Construction
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required, a NEMA Section 30 report must be submitted to GDARD within 14 days of the incident.	Contractor	Construction
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	Construction
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Construction
Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.	Contractor	Construction
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Construction



<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
All machinery and equipment must be inspected regularly for faults and possible leaks,	Contractor	Construction
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Construction
Construction machinery must be stored in an appropriately sealed area.	Contractor	Construction
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	Construction
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Construction
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Construction
No discharge of effluents or wash water from cement batching, or any other areas (wash areas) is allowed to enter nearby demarcated drainage features. Runoff must be strictly controlled in the vicinity of any cement batching areas. Cement batching or fixing of any leaks of vehicles or plant must be done off site.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system. Therefore, sufficient drip trays or similar impermeable layers must be readily available on site. No leaks must be eminent from these impermeable layers.	Contractor	Construction
As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site.	Contractor	Construction
Have appropriate action plans on site, and training for contactors and employees in the event of spills, leaks and other potential impacts to the aquatic systems. All waste generated on-site during construction must be adequately managed.	Contractor	Construction
Minimise fuels and chemicals stored on site.	Contractor	Construction
Implement a contingency plan to handle spills, so that environmental damage is avoided.	Contractor	Construction
Drip trays must be used during all fuel/chemical dispensing and beneath standing machinery/plant, at any area on the development site.	Contractor	Construction
In the case of petrochemical spillages, the spill must be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).	Contractor	Construction
Implement appropriate measures to ensure strict use and management of all hazardous materials used on site.	Contractor	Construction
In the event of a significant spill or leak of hazardous substances (petrol and diesel) during the construction or operational phase,	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
such incident(s) must be reported to all relevant authorities, including the Chief Director: Development Planning of the DEA&DP, in accordance with section 30(5) of the NEMA pertaining to the control of incidents.		
Implement appropriate measures to ensure strict management of potential sources of pollutants (e.g. litter, hydrocarbons from vehicles and machinery, cement during construction etc.).	Contractor	Construction
Implement appropriate measures to ensure containment of all contaminated water by means of careful run-off management on the development site.	Contractor	Construction
Any solid waste should be appropriately stored at the site until such time that it can be disposed of at a licensed facility, suitable of accepting such waste.	Contractor	Construction
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in Construction Method Statements for the project and strictly enforced.	Contractor	Construction
Storage of potential contaminants should be undertaken in bunded areas	Contractor ECO	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No chemical spills outside of designated storage areas.</li> <li>» No water or soil contamination by spills.</li> <li>» Safe storage of hazardous chemicals.</li> <li>» Proper waste management.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout Construction.</li> <li>» A complaints register must be maintained, in which any complaints from the community will be logged.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» On-going visual assessment to detect polluted areas and the application of clean-up and preventative procedures.</li> <li>» Monitor hydrocarbon spills from vehicles and machinery during construction continuously and record volume and nature of spill, location and clean-up actions.</li> <li>» Monitor maintenance of drains and intercept drains weekly.</li> <li>» Analyse soil samples for pollution in areas of known spills or where a breach of containment is evident when it occurs.</li> <li>» Records of accidental spills and clean-up procedures and the results thereof must be audited on an annual basis by the ECO.</li> <li>» Records of all incidents that caused chemical pollution must be kept and a summary of the results must be reported to management annually.</li> </ul>

## OBJECTIVE 14: Effective management of concrete batching plant

Concrete is required during the construction of the solar energy facility. In this regard there could be a need to establish a temporary 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, etc.), 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>	» Concrete batching plant.
<b>Potential Impact</b>	» Dust emissions. » Release of contaminated water. » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation.
<b>Activity/risk source</b>	» Operation of the batching plant. » Packaging and other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks and site preparation.
<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>
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
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
The concrete batching plant site should demonstrate good maintenance practices, including regular collection and disposal to prevent dust build-up.	Contractor	Construction
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	Contractor	Construction
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage.	Contractor	Construction
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 directs material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	Contractor	Construction
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
Contaminated stormwater and process wastewater should be captured and recycled where possible. A wastewater	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
collection and recycling system should be designed to collect contaminated water.		
Ensure that all practicable steps are taken to minimise the adverse effect of 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
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction
Cement bags must not be allowed to be wind dispersed on site. Where cement works are being undertaken a weather- and animal- proof receptacle must be placed nearby to avoid cement bags blown around site.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints regarding dust.</li> <li>» No water or soil contamination by chemical spills.</li> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout the Construction.</li> <li>» A complaints register must be maintained, in which any complaints from the community must be logged. Complaints will be investigated and, if appropriate, acted upon.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» The Developer or appointed ECO/EO must monitor indicators listed above to ensure that they have been met for the Construction.</li> </ul>

**OBJECTIVE 15: Traffic management and transportation of equipment and materials to site**

The construction and decommissioning phases of the project will be the most significant in terms of traffic impacts resulting from the transport of equipment (including solar 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 mostly to works within the site boundary (i.e. the solar facility and ancillary infrastructure) and the external road network.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted.</li> <li>» Risk of accidents.</li> <li>» Deterioration of road pavement conditions (i.e. both surfaced and gravel road) due to abnormal loads.</li> </ul>
<b>Activity/risk source</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> </ul>

	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Foundations or plant equipment installation.</li> <li>» Mobile construction equipment movement on-site.</li> <li>» 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 solar energy facility on the local traffic volume, existing infrastructure, property owners, animals, and road users.</li> <li>» To minimise the potential for negative interaction between pedestrians or sensitive users and traffic associated with the solar energy 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>
Heavy vehicles travelling on secondary roads should adhere to low-speed limits to minimise noise and dust pollution.	Contractor(s), (Transportation sub-contractor)	Construction
If feasible, no construction activities should be carried out during weekends and outside day time working hours	Contractor	Construction
The delivery of solar components to the site must be staggered and trips must be scheduled to occur outside of peak traffic periods.	Contractor	Construction
The use of mobile batching plants and quarries in close proximity to the project site would decrease the impact on the surrounding road network.	Contractor	Construction
Regular maintenance of gravel roads by the contractor.	Contractor	Construction
A designated access (or accesses) to the proposed site must be created to ensure safe entry and exit.	Contractor	Construction
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor(s), (Transportation sub-contractor)	Duration of contract
Vehicles carrying material to the site should avoid using roads through densely populated built-up areas.	Contractor(s), (Transportation sub-contractor)	Duration of contract
The movement of all vehicles (barring clearing machinery) within the site must be on designated roadways.	Contractor(s)	Duration of contract
All hazardous substances must be transported in accordance with the relevant legislation and regulations.	Contractor(s)	Duration of contract
Roads must be designed so that changes to surface water runoff are avoided, and erosion is not initiated. Energy dissipation, such as stone berms or blocks must be strategically placed along the road margins as surface runoff leaves the roads and enters the surrounding environment with the potential for severe erosion and damage to road margins. The steeper the slope of the road, the more regular the berms should be spaced and can be as close as one meter apart where necessary;	Contractor(s)	Duration of contract
Staff and general trips should occur outside of peak traffic periods as much as possible	Contractor(s)	Duration of contract
Haulage routes should be maintained	Contractor(s)	Duration of contract
Dust suppression of internal gravel roads and the access roads.	Contractor(s)	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Component delivery to/ removal from the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.	Contractor(s)	Duration of contract
The use of mobile batching plants and quarries near the site would decrease the impact on the surrounding road network, if available and feasible.	Contractor(s)	Duration of contract
Staff and general trips should occur outside of peak traffic periods.	Contractor(s)	Duration of contract
A “dry run” of the preferred route by the haulage company. Should the haulage company be familiar with the route, evidence is to be provided to the Client and the Contractor.	Contractor(s)	Duration of contract
Design and maintenance of the internal gravel roads and maintenance of the access roads.	Contractor(s)	Duration of contract
If required, any low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved (to be arranged by haulage company and agreed on with the service provider of the OHL) or raised to accommodate the abnormal load vehicles.	Contractor(s)	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No traffic incidents involving project personnel or appointed contractors.</li> <li>» Appropriate signage in place.</li> <li>» No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the solar energy facility.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Visual monitoring of traffic control measures to ensure they are effective.</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 16: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed**

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

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
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<b>Potential Impact</b>	» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
<b>Activity/risk source</b>	» Site preparation and earthworks. » Excavation of foundations and trenches. » Temporary laydown areas. » Temporary access roads/tracks. » Other disturbed areas/footprints.
<b>Mitigation: Target/Objective</b>	» To ensure and encourage site rehabilitation of disturbed areas. » To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
A site rehabilitation programme should be compiled and implemented (refer to <b>Appendix D</b> ).	Contractor in consultation with Specialist	Construction
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken.	Contractor	Following execution of the works
All cleared areas should be revegetated with indigenous perennial shrubs and succulents from the local area. Dead material from site clearing can be used to encourage this process and can be set aside during clearing and later placed on the cleared areas to encourage recovery.	Contractor	Following execution of the works
Rehabilitation of the working areas must be concurrent with the construction of the project, where appropriate	Contractor	Construction
All temporary facilities, equipment and waste materials must be removed from site and appropriately disposed of.	Contractor	Following execution of the works
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following execution of the works
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Contractor	Following execution of the works
On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis, as per the alien vegetation management plan (Objective 7).	Contractor	Construction
All areas disturbed by construction related activities, such as access roads on the site, construction camps etc., should be rehabilitated at the end of the construction phase.	Contractor	Construction
The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be included in the EMPr	Developer	Construction
The implementation of the Rehabilitation Programme should be monitored by the ECO.	Contractor - implement ECO - monitor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» All portions of site, including construction camp and working areas, cleared of equipment and temporary facilities.</li> <li>» Topsoil replaced on all areas and stabilised.</li> <li>» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites.</li> <li>» Closed site free of erosion and alien invasive plants.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» On-going inspection of rehabilitated areas in order to determine the effectiveness of the rehabilitation measures implemented during the operational lifespan of the solar energy facility.</li> <li>» On-going alien plant monitoring and removal should be undertaken on an annual basis.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> </ul>

**OBJECTIVE 17: Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the project area;**

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV Footprint, laydown areas and road creation</li> <li>» Project Area</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community</li> <li>» Introduction of alien and invasive species, especially plants</li> <li>» Destruction of protected plant species</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Land clearing, fire and dust</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The delineated drainage/riparian are considered no go areas for any infrastructure associated with the proposed development. The recommended buffer zones must be strictly adhered to during the construction phase of the project, with exception of any authorised activities and structures required to traverse an aquatic resource. Any supporting aspects and activities not required to be within the buffer area must adhere to the buffer zone	Project manager, Environmental Officer	Planning and Construction phase
Demarcate work areas and sensitive areas during the construction phase to avoid affecting outside areas. Use physical barriers e.g., safety tape, not painted lines, and use signage	Project manager, Environmental Officer	Planning and Construction phase
Where possible, existing access routes and walking paths must be made use of.	Project manager, Environmental Officer	Planning and Construction phase
Do not clear areas of indigenous vegetation outside of the direct project footprint	Project manager, Environmental Officer	Planning and Construction phase
Minimise vegetation clearing to the minimum required	Project manager, Environmental Officer	Planning and Construction phase
Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site	Project manager, Environmental Officer	Planning and Construction phase



Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a rehabilitation plan from the onset of the project;	Project manager, Environmental Officer	Planning and Construction phase
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and bare (unvegetated) areas. -Reduce the dust generated by operational vehicles and earth moving machinery, through wetting the soil surface (with “dirty water”) and putting up signs to enforce speed limits to enforce reduced speeds. -No non-environmentally friendly suppressants may be used as this could result in pollution of water sources.	Project manager, Environmental Officer	Planning and Construction phase
Rehabilitate areas as soon as they are no longer impacted by construction. -The rehabilitated areas must be revegetated with indigenous vegetation	Project manager, Environmental Officer	Planning and Construction phase
Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other others in need of stabilisation and vegetation cover.	Project manager, Environmental Officer	Planning and Construction phase
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.	Project manager, Environmental Officer	Planning and Construction phase
Do not clear areas of indigenous vegetation outside of the direct project footprint	Project manager, Environmental Officer	Planning and Construction phase
Minimise vegetation clearing to the minimum required	Project manager, Environmental Officer	Planning and Construction phase
Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site	Project manager, Environmental Officer	Planning and Construction phase
Compile and implement a rehabilitation plan from the onset of the project;	Project manager, Environmental Officer	Planning and Construction phase
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and bare (unvegetated) areas -Reduce the dust generated by operational vehicles and earth moving machinery, through wetting the soil surface (with “dirty water”) and putting up signs to enforce speed limits to enforce reduced speeds. -No non-environmentally friendly suppressants may be used as this could result in pollution of water sources	Project manager, Environmental Officer	Planning and Construction phase
Rehabilitate areas as soon as they are no longer impacted by construction. -The rehabilitated areas must be revegetated with indigenous vegetation	Project manager, Environmental Officer	Planning and Construction phase
Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing	Project manager, Environmental Officer	Planning and Construction phase

Mitigation: Action/control	Responsibility	Timeframe
seedbank. Surplus rehabilitation material can be applied to other others in need of stabilisation and vegetation cover		
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities	Project manager, Environmental Officer	Planning and Construction phase
A protected tree assessment must be completed prior to the commencement of the project.	Project manager, Environmental Officer	Planning and Construction phase
Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual to be removed or destroyed due to the development.	Project manager, Environmental Officer	Planning and Construction phase
High visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program	Project manager, Environmental Officer	Planning and Construction phase
All protected plants should be relocated where possible.	Project manager, Environmental Officer	Planning and Construction phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Clearing restricted to 'allowable' areas, dust generated, limited unplanned fires, rehabilitation.</li> <li>» Clearing restricted to 'allowable' areas, limited unplanned fires, rehabilitation</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Daily during the construction phase</li> <li>» Daily during the construction phase for all mitigation</li> </ul>

**OBJECTIVE 18: Prevent the direct and indirect loss and disturbance of faunal species and community (including potential SCCs)**

<b>Project component/s</b>	» PV Footprint, laydown areas and road creation
<b>Potential Impact</b>	» Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and poaching)
<b>Activity/risk source</b>	» Land clearing, Fire and human presence as well as roads.
<b>Mitigation: Target/Objective</b>	» Avoidance / minimisation of the disturbance and mortality of fauna

Mitigation: Action/control	Responsibility	Timeframe
Demarcate work areas and sensitive areas during the construction phase to avoid affecting outside areas. Use physical barriers e.g., safety tape, not painted lines, and use signage.	Project manager, Environmental Officer	Planning and Construction phase
Prior to vegetation clearing activities, the area to be cleared should be walked on foot by 1-2 individuals to create a disturbance in order for fauna to move off. Sites should be disturbed only prior to the area having to be cleared, not more than 1 day in advance	Project manager, Environmental Officer	Planning and Construction phase

Mitigation: Action/control	Responsibility	Timeframe
Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist.	Project manager, Environmental Officer	Planning and Construction phase
All construction vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.	Project manager, Environmental Officer	Planning and Construction phase
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area	Project manager, Environmental Officer	Planning and Construction phase
Minimise vegetation clearing to the minimum required. Areas should be cleared and disturbed on a need's basis only, as opposed to clearing and disturbing a number of sites simultaneously.	Project manager, Environmental Officer	Planning and Construction phase
Provide All personnel and contractors to undergo Environmental Awareness Training to all personnel and contractors. A signed register of attendance must be kept for proof.	Project manager, Environmental Officer	Planning and Construction phase
The timing between clearing of an area and subsequent development must be minimized to avoid fauna from re-entering the site to be disturbed.	Project manager, Environmental Officer	Planning and Construction phase
Any holes/deep excavations must be done in a progressive manner on a needs basis only. No holes/excavations may be left open overnight. In the event holes/excavations are required to remain open overnight, these areas must be covered to prevent fauna falling into these areas and subsequently inspected prior to backfilling	Project manager, Environmental Officer	Planning and Construction phase
Where possible, work should be restricted to one area at a time and be systematic. This is to reduce the number and extent of on-site activities, allowing fauna to move off as the Project progresses. This will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.	Project manager, Environmental Officer	Planning and Construction phase
Considering that many of the mammal fauna recorded within the project area are nocturnal, no construction activity is to occur at night.	Project manager, Environmental Officer	Planning and Construction phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Amount of observable fauna mortalities</li> <li>» Sequence ,direction and timing of land clearing.</li> <li>» Speed limits adhered to</li> </ul>
<b>Monitoring</b>	» Daily during the construction phase for all mitigation

**7.2. Detailing Method Statements**

**OBJECTIVE 19: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk**

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

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

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

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

- » Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc., including a site camp plan indicating all of these).
- » Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure.
- » Stipulate norms and standards for water supply and usage (i.e. comply strictly to licence and legislation requirements and restrictions).
- » Stipulate the stormwater management procedures recommended in the stormwater management method statement.
- » Ablution facilities (placement, maintenance, management and servicing).
- » Solid Waste Management:
  - \* Description of the waste storage facilities (on site and accumulative).
  - \* Placement of waste stored (on site and accumulative).
  - \* Management and collection of the waste process.
  - \* Recycle, re-use and removal process and procedure.
- » Liquid waste management:

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

The Contractor may not commence with the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. The ECO may be approached to provide input into the Method Statement or to comment thereon.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

### 7.3. Awareness and Competence: Construction of the Quantum 1 SEF

**OBJECTIVE 20: 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:

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

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

### **7.3.1 Environmental Awareness Training**

Environmental Awareness Training must be undertaken by the Contractor and must take the form of an on-site talk and demonstration by the EO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the SHE Officer on site.

### **7.3.2 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 be undertaken by the Contractor's EO and should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight the 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.

### **7.3.3 Toolbox Talks**

Toolbox talks should be held on a scheduled and regular basis (at least once a week) 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 the reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

## **7.4. Monitoring Programme: Construction of the solar energy facility**

### **OBJECTIVE 21: 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. Monitoring during construction must be on-going for the duration of this phase. The Project Manager must ensure that the monitoring is conducted and reported.

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

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications

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

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

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

#### **7.4.1. Non-Conformance Reports**

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided with 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 within 48 (forty eight) hours.

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

#### **7.4.2. Incident Reports**

According to Section 30 of National Environmental Management Act (NEMA), an "Incident" is defined as an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed.

In terms of the requirements of NEMA, the responsible person must, within 14 days of the incident, report to the Director General, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including:

- (a) the nature of the incident;
- (b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects;
- (c) initial measures taken to minimise impacts;
- (d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and
- (e) measures taken and to be taken to avoid a recurrence of such incident.



### **7.4.3. Monitoring Reports**

A monitoring report will be compiled by the ECO on a monthly basis (or as dictated by the conditions of the EA) and must be submitted to the Director: Compliance Monitoring at GDARD 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, or any other aspect as per the Appendix 7 of the EIA Regulations (2014, as amended 2017). The Contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the GDARD regarding waste related activities.

### **7.4.4. Audit Report**

The Developer must ensure that project compliance with the conditions of the Environmental Authorisation is audited by an independent auditor, and that the audit reports are submitted to the Director: Compliance Monitoring at the GDARD at intervals as dictated by the conditions of the EA. Such audits must be undertaken during both the construction and operation phases of the solar energy facility. The effectiveness of the mitigation measures and recommendations for amongst others the following: grievance incidents; waste management, alien and open space management, re-vegetation and rehabilitation, plant rescue and protection and traffic and transportation should be audited. The results must form part of the project monitoring and audit reports.

### **7.4.5. Final Audit Report**

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

## CHAPTER 8: MANAGEMENT PROGRAMME: OPERATION

**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 Quantum 1 SEF in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Enables the solar 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 will be to ensure the implementation of the operational EMPr.

### 8.1. Objectives

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

#### OBJECTIVE 1: Securing the site and general maintenance during operation

Safety issues may arise with public access to the solar energy facility substation. Prevention and control measures to manage public access are therefore important.

General maintenance at Quantum 1 SEF will be required during the operation of solar energy facility. The maintenance required may also include the replacement of solar panels, if required during the operation lifetime of the facility.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Hazards to landowners and public.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Uncontrolled access to the solar energy facility and associated infrastructure.</li> </ul>
<b>Mitigation:</b>	<ul style="list-style-type: none"> <li>» To secure the site against unauthorised entry.</li> </ul>
<b>Target/Objective</b>	<ul style="list-style-type: none"> <li>» To protect members of the public/landowners/residents.</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Where feasible, motion detection lighting must be used to minimise the unnecessary illumination of areas	O&M Operator	Operation

Mitigation: Action/control	Responsibility	Timeframe
Minimise traffic and the use of vehicle lights of the road during the night.	O&M Operator	Operation
Schedule trips for the provision of water for the cleaning of panels outside peak traffic times as much as possible.	O&M Operator	Operation
Maintain roads and servitudes to forego erosion and to suppress dust.	O&M Operator	Operation
The road margins should be hydroseeded with vigorous growing indigenous grasses that are drought tolerant to lower erosion of these key areas;	O&M Operator	Operation
The section of roads which will traverse the lowest lying areas/potentially wet areas or steeper slopes will be subjected to traffic from vehicles for inspections and maintenance on site with the potential for damage to habitat and erosion and thus require permeable paving. The permeable paving provides a stable platform to carry the loads of service vehicles whilst the vegetation growing through the permeable pavers compliments the surrounding vegetation, preventing erosion in these key areas;	O&M Operator	Operation
Monitor rehabilitated areas and implement remedial action as and when required.	O&M Operator	Operation
The Environmental Manager must provide fourteen (14) days written notification to the GDARD that the operational phase of the SEF will commence.	EM	Prior to operation
Onsite maintenance of the solar panels during the operation phase must in no way impact or negatively affect the environment, and contractors or other service providers providing onsite maintenance must be made aware of this EMP and the content thereof.	O&M Operator	Operation
Secure access to the site and entrances.	O&M Operator	Operation
Post information boards about public safety hazards and emergency contact information.	O&M Operator	Operation
Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving the site.	O&M Operator	Operation
No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation.	O&M Operator	Operation
Should solar panels be required to be replaced, the following will apply: <ul style="list-style-type: none"> <li>» Site access must be confirmed for the transportation of the required solar components and equipment to the site and location of the infrastructure to be replaced.</li> <li>» Materials and solar structures are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur.</li> <li>» Full clean-up of all materials must be undertaken after the removal and replacement of the solar panels and associated infrastructure is complete, and disturbed areas appropriately rehabilitated.</li> </ul>	O&M Operator	Operation

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>» Most of the materials used for solar panels can be recycled. The majority of the solar panels can be recovered and re-used or recycled. Recyclable materials must be transported off-site by truck and managed at appropriate facilities in accordance with relevant waste management regulations. No waste materials may be left on-site following the replacement.</li> <li>» Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.</li> </ul>		
If soil erosion is detected, the area must be stabilised by the use of geo-textiles (or other appropriate means) and facilitated re-vegetation.	O&M Operator	Operation
Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills.	O&M Operator	Operation
No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area.	O&M Operator	Operation

<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>» No complaints from landowners/ public.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Regular visual inspection of fence for signs of deterioration/forced access.</li> <li>» An incident reporting system must be used to record non-conformances to the EMPr.</li> <li>» A public complaints register must be developed and maintained on site.</li> <li>» Landowners should be consulted regularly.</li> </ul>

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

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

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of vegetation and/or habitat.</li> <li>» Alien plant invasion.</li> <li>» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.</li> <li>» Continued fragmentation and degradation of habitats and ecosystems</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Movement of employee vehicles within and around site.</li> </ul>

	» Dust, unregulated clearing, IAP plant proliferation and edge effects
<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> <li>» Avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project site. No plant species whether indigenous or exotic should be brought into/taken from the site, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Project manager, Environmental Officer	Operation
Access roads should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Energy dissipation, such as stone berms or blocks must be strategically placed along the road margins as surface runoff leaves the roads and enters the surrounding environment with the potential for severe erosion and damage to road margins. The steeper the slope of the road, the more regular the berms should be spaced and can be as close as one meter apart where necessary;	Project manager, Environmental Officer	Operation
The road margins should be hydroseeded with vigorous growing indigenous grasses that are drought tolerant to lower erosion of these key areas;	Project manager, Environmental Officer	Operation
the section of roads which will traverse the lowest lying areas/potentially wet areas or steeper slopes will be subjected to traffic from vehicles for inspections and maintenance on site with the potential for damage to habitat and erosion and thus require permeable paving. The permeable paving provides a stable platform to carry the loads of service vehicles whilst the vegetation growing through the permeable pavers compliments the surrounding vegetation, preventing erosion in these key areas;	Project manager, Environmental Officer	Operation
All erosion observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Project manager, Environmental Officer	Operation
There should be follow-up rehabilitation and re-vegetation of any remaining denuded areas with local indigenous perennial grass, shrubs and trees.	Project manager, Environmental Officer	Operation
All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan	Project manager, Environmental Officer	Operation
Any fauna threatened by the maintenance and operational activities should be removed to a safe location by an appropriate individual.	Project manager, Environmental Officer	Operation
All maintenance vehicles should adhere to a low-speed limit to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within	O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
the facility as well as on the public gravel access roads to the site.		
Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. This should make provision for annual monitoring and rehabilitation.	O&M Operator	Operation
All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	O&M Operator	Operation
Alien management at the site should take place according to the Alien Invasive Management Plan	O&M Operator	Operation
Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem plant species are already present in the area and are likely to increase rapidly if not controlled.	O&M Operator	Operation
Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility must be undertaken as these are also likely to be prone to invasion problems.	O&M Operator	Operation
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.	O&M Operator	Operation
Vehicle movements must be restricted to designated roadways.	O&M Operator	Operation
In order to increase general faunal protection, the use of any pesticide in the solar energy facility area should be prohibited.	O&M Operator	Operation
Roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	O&M Operator	Operation
Vegetation control within the solar energy facility should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner if necessary.	O&M Specialist Operator	Operation
All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.	O&M Operator	Operation
The use of herbicides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	O&M Operator	Operation
Implement an animal removal plan to ensure safety of workers and fauna.	O&M Operator	Operation
Fire breaks should be established, where appropriate and as discussed with the landowners. Access roads could also act as fire breaks.	O&M Specialist Operator	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.	O&M Operator	Operation
Annual site inspection for erosion with follow up remedial action where problems are identified.	Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Noise and disturbance on the site should be kept to a minimum during operation and maintenance activities.	O&M Operator	Operation
If panels do not possess anti-reflective coatings, white strips must be placed on the edge of the solar panels to reduce reflection and prevent collisions. This is especially pertinent as several species exhibit daily movement between water resources and feeding/nesting areas. The species may recognise the panel array as water bodies (lake effect as described above) and collide with the panels, causing mortality.	Developer Contractor	Construction Operation
Once operational, vehicle and pedestrian access to the site should be controlled and restricted to prevent unnecessary destruction of vegetation.	O&M operator	Operation
Prevent birds from nesting in substation infrastructure through exclusion covers or spikes if required (determined on a case-by-case basis).	Developer Specialist	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No further disturbance to vegetation or terrestrial faunal habitats.</li> <li>» No erosion problems resulting from operational activities within the solar energy facility.</li> <li>» Low abundance of alien plants within affected areas.</li> <li>» Maintenance of a ground cover that resist erosion.</li> <li>» Continued improvement of rehabilitation efforts.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation on-site by environmental manager.</li> <li>» Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.</li> <li>» Annual monitoring with records of alien species presence and clearing actions.</li> <li>» Annual monitoring with records of erosion problems and mitigation actions taken with photographs.</li> </ul>

### OBJECTIVE 3: Minimisation of visual impact

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Enhanced visual intrusion.</li> </ul>

	» Visual impact of the solar facility degradation (including operational solar panels) and vegetation rehabilitation failure.
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Associated lighting.</li> <li>» Solar panels and other infrastructure.</li> <li>» Access roads.</li> <li>» Other associated infrastructure.</li> <li>» Viewing of the degradation and vegetation rehabilitation failure by observers on or near the site.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise the potential for visual impact.</li> <li>» Well maintained and neat facility.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Adjust tilt angles of the panels if glint and glare issues become evident where possible. If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site.	O&M Operator	Operation
Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites.	O&M Operator	Operation
Maintain the general appearance of the facility as a whole, including the Panels, servitudes and the ancillary buildings.	O&M Operator	Operation and maintenance
Maintain roads and servitudes to forego erosion and to suppress dust.	O&M Operator	Operation
Energy dissipation, such as stone berms or blocks must be strategically placed along the road margins as surface runoff leaves the roads and enters the surrounding environment with the potential for severe erosion and damage to road margins. The steeper the slope of the road, the more regular the berms should be spaced and can be as close as one meter apart where necessary;		
The road margins should be hydroseeded with vigorous growing indigenous grasses that are drought tolerant to lower erosion of these key areas;		
The section of roads which will traverse the lowest lying areas/potentially wet areas or steeper slopes will be subjected to traffic from vehicles for inspections and maintenance on site with the potential for damage to habitat and erosion and thus require permeable paving. The permeable paving provides a stable platform to carry the loads of service vehicles whilst the vegetation growing through the permeable pavers compliments the surrounding vegetation, preventing erosion in these key areas;		
Monitor rehabilitated areas, and implement remedial action as and when required.	O&M Operator	Operation
If the facility is to be lit at night, lighting should be kept to a minimum and should preferably not be white light. Flashing strobe-like lights should be used where possible.	O&M Operator	Operation



Mitigation: Action/control	Responsibility	Timeframe
Investigate the potential to screen affected receptor sites with planted vegetation cover	O&M Operator	Operation
Adjust tilt angles of the panels if glint and glare issues become evident where possible. If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site.	Project proponent / operator	Throughout the operation phase.
facility as a whole, including the PV panels, servitudes and the ancillary structures.	Project proponent / operator	Throughout the operation phase.
Maintain roads and servitudes to forego erosion and to suppress dust.	Project proponent / operator	Throughout the operation phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Project proponent / operator	Throughout the operation phase.
Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites.	Project proponent / operator	Throughout the operation phase.

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

**OBJECTIVE 4: Appropriate management of stormwater and erosion control**

<b>Project component/s</b>	» PV arrays; » Substation; » BESS; » Access roads; and » Associated infrastructure.
<b>Potential Impact</b>	» Erosion and soil loss. » Increased runoff. » Downstream sedimentation.
<b>Activities/risk sources</b>	» Rainfall and wind erosion of disturbed areas. » Concentrated discharge of water from project site. » Stormwater run-off from sealed surfaces. » Roadside drainage ditches. » Project related infrastructure, such as buildings, solar panels and fences.
<b>Mitigation: Target/Objective</b>	» To minimise erosion of soil from site during operation. » To minimise damage to vegetation by erosion or deposition. » To retain all topsoil with a stable soil surface

Mitigation: Action/control	Responsibility	Timeframe
Any erosion problems observed along access roads or any hardened/engineered surface should be rectified immediately and monitored thereafter to ensure that they do not re-occur.	O&M Operator	Operation phase

Mitigation: Action/control	Responsibility	Timeframe
All bare areas (excluding agricultural land and the development footprint), affected by the development, should be re-vegetated with locally occurring species, to bind the soil and limit erosion potential where applicable.	O&M Operator	Operation phase
Re-instate as much of the eroded area to its pre-disturbed, "natural" geometry (no change in elevation and any banks not to be steepened) where possible.	O&M Operator	Operation phase
Roads and other disturbed areas should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring by the EO to assess the success of the remediation.	O&M Operator	Operation phase
Any stormwater within the site must be handled in a suitable manner as per the management measures in stormwater management plan.	O&M Operator	Operation phase
Stormwater from hardstand areas, buildings and the substation must be managed using appropriate channels and swales when located within steep areas.	O&M Operator	Operation phase
Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving the solar energy facility site.	O&M Operator	Operation phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal level of soil erosion around site.</li> <li>» Minimal level of soil degradation.</li> <li>» No activity outside demarcated areas.</li> <li>» Progressive return of disturbed and rehabilitated areas to the desired end state.</li> <li>» No indications of visible topsoil loss.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Continual inspections of the site by the Environmental Manager/EO.</li> <li>» Reporting of ineffective sediment control systems and rectification as soon as possible.</li> <li>» If soil loss is suspected, acceleration of soil conservation and rehabilitation measures must be implemented.</li> </ul>

## OBJECTIVE 5: Appropriate handling and management of hazardous substances and waste

The operation of the facility will involve the generation of limited waste products, most significantly spent battery components which must be appropriately managed.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» PV arrays;</li> <li>» Substation;</li> <li>» BESS;</li> <li>» Access roads; and</li> <li>» Associated infrastructure..</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Inefficient use of resources resulting in excessive waste generation.</li> <li>» Litter or contamination of the site or water through poor waste management practices.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Transformers and switchgear – substation.</li> <li>» Fuel and oil storage.</li> </ul>

<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To comply with waste management legislation.</li> <li>» To minimise production of waste.</li> <li>» To ensure appropriate waste disposal.</li> <li>» To avoid environmental harm from waste disposal.</li> </ul>
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Mitigation: Action/control	Responsibility	Timeframe
Waste must be separated at site and taken to a suitably licenced facility. Proof of disposal must be kept on file on site. As far as possible, materials should be separated into plastics, tins/steel, paper/cardboard, hazardous materials, etc.	O&M Operator	Operation
All waste receptacles must be weather- and animal- proof to avoid any littering or possible environmental degradation.	O&M Operator	Operation
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	O&M Operator	Operation
Storage areas for hazardous substances must be conducted within a secured and clearly demarcated area.	O&M Operator	Operation
Any hazardous materials (paint, oil, petrol, diesel, etc) must be stored on an impermeable surface even when out in the field and not only within the demarcated storage area. Therefore, sufficient drip trays must be made available on site and taken with workers to where the works are undertaken on the site.	O&M 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.	O&M 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.	O&M Operator	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	O&M Operator / waste management contractor	Operation
Used oils and chemicals: » Where these cannot be recycled, appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	O&M Operator	Operation
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	O&M Operator	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	O&M Operator	Operation
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	O&M Operator	Operation and maintenance

Mitigation: Action/control	Responsibility	Timeframe
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	O&M Operator	Operation
Disposal and storage of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Operator/ waste management contractor	Operation
Maximum domestic waste storage period will be 7 days.	O&M Operator	Operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used.	O&M Operator	Operation
Appropriate ablution facilities should be provided for on-site staff during the operation of the facility.	Contractor	Construction Operation
Utilise cleaning systems for the panels needing less vehicle trips.	Contractor	Operation
No waste may be buried or burn on site.	O&M Operator	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or 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.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Waste collection must be monitored internally on a regular basis.</li> <li>» Waste documentation must be completed and made available for inspection on request.</li> <li>» An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon.</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. All appropriate waste disposal certificates must accompany the monthly reports.</li> </ul>

**OBJECTIVE 6: Ensure appropriate operation and maintenance of the battery energy storage system**

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

Mitigation: Action/control	Responsibility	Timeframe
Compile (and adhere to) a procedure for the safe handling of battery cells.	O&M Contractor	Operation
Ensure that battery supplier user guides, safety specifications and MSDS are filed on site at all times.	O&M Contractor	Operation
Operate, maintain and monitor the BESS as per supplier specifications.	O&M Contractor	Operation

Mitigation: Action/control	Responsibility	Timeframe
Compile method statements for approval by the Technical/SHEQ Manager for battery cell, electrolyte and battery cell/ container replacement. Maintain method statements on site.	O&M Contractor	Operation
Ensure that all maintenance contractors/ staff are familiar with the supplier's specifications.	O&M Contractor	Operation
Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock.	O&M Contractor	Operation
Provide signage on site specifying how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. toxic fumes). Provide suitable firefighting equipment on site.	O&M Contractor	Operation
Maintain strict access control to the battery storage area.	O&M Contractor	Operation
Undertake regular visual checks on BESS equipment to identify signs of damage or leaks.	O&M Contractor	Operation
Provide environmental awareness training to all personnel on site. Training should include discussion of: <ul style="list-style-type: none"> <li>o Potential impact of electrolyte spills on groundwater;</li> <li>o Suitable disposal of waste and effluent;</li> <li>o Key measures in the EMP relevant to worker's activities;</li> <li>o How incidents and suggestions for improvement can be reported.</li> </ul> Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	O&M Contractor	Operation

<b>Performance Indicator</b>	» BESS operated and maintained in accordance with supplier specifications. » Appropriate signage on site. » Employees appropriately trained. » Required documentation available on site. » Firefighting equipment and training provided before the operation phase commences.
<b>Monitoring</b>	» The O&M contractor must monitor indicators listed above to ensure that they have been met.

**OBJECTIVE 7: Maximise benefits and opportunities for local communities associated with the operation of the solar energy facility**

<b>Project component/s</b>	» Solar Energy Facility. » Day to day operational activities associated with the solar facility including maintenance.
<b>Potential Impact</b>	» The opportunities and benefits associated with the creation of local employment and business should be maximised as far as possible.
<b>Activity/risk source</b>	» The operation phase of the solar facility will create permanent employment opportunities.

	» The establishment of a solar facility has the potential to create an attraction for visitors to the area. The development also has the potential to promote the benefits of renewable energy projects.
<b>Mitigation: Target/Objective</b>	» Create medium- to long-term full time employment opportunities for locals.

Mitigation: Action/control	Responsibility	Timeframe
Wherever practicable, vocational training programs ought to be implemented to support employee skill development.	O&M Operator	Operation
Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy.	O&M Operator	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Maximum amount of semi and unskilled labour locally sourced where possible.</li> <li>» Local suppliers and SMMEs contracted where possible.</li> <li>» Skills transfer facilitated where required.</li> <li>» A social development and economic development programme developed and implemented.</li> </ul>
<b>Monitoring and Reporting</b>	» Indicators listed above must be met for the operation phase.

**OBJECTIVE 8: Implement an appropriate fire management plan during the operation phase**

The vegetation on the site may be at risk of fire, especially during drought conditions experienced in the area. 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 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 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
Provide adequate firefighting equipment on site. Apply for membership to the local Fire Protection Association, should there be one.	O&M Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.). Access roads may also act as fire breaks.	O&M Operator	Operation
Upon completion of the Construction, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Operator	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Operator	Operation
Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly.	O&M Operator	Operation
Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry.	O&M Operator	Operation
The contractor should enter an agreement with the local farmers before the construction phase that any damages or losses during the construction phase related to the risk of fire and that are created by staff during the construction phase, are borne by the contractor.	O&M Operator	Operation

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

### OBJECTIVE 9: Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the project area

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Operational Area, PV as well as roads.</li> <li>» Project Area</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Continued fragmentation and degradation of habitats and ecosystems</li> <li>» Spread of alien and/or invasive species</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Dust, unregulated clearing, IAP plant proliferation and edge effects</li> <li>» Cleared Areas, laydown areas, fire and dust.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems</li> <li>» Avoidance / minimisation of the disturbance and degradation of vegetation and ecosystems</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
All 'Very High' SEI slope habitats must be avoided. Avoid the disturbance or destruction of Sandy Grassland ('Very High' SEI areas) as far as possible. Offset mitigation will be required for construction activities within these areas.	Project manager, Environmental Officer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
It should be made an offence for any staff to /take bring any plant species into/out of any portion of the PAOI. No plant species whether indigenous or exotic should be brought into/taken from the PAOI, to prevent the spread of exotic or invasive species or the illegal collection of plants	Project manager, Environmental Officer	Operation
All 'Very High' SEI slope habitats must be avoided. Avoid the disturbance or destruction of Sandy Grassland ('Very High' SEI areas) as far as possible. Offset mitigation will be required for construction activities within these areas.		
A Rehabilitation Plan must be written for the development area and ensured that it be adhered to.	Project manager, Environmental Officer	Operation
Access roads should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.	Project manager, Environmental Officer	Operation
All erosion observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Project manager, Environmental Officer	Operation
There should be follow-up rehabilitation and re-vegetation of any remaining denuded areas with local indigenous perennial grass, shrubs and trees.	Project manager, Environmental Officer	Operation
Implementation of an alien vegetation management plan. Regular monitoring for IAP encroachment during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project. All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan. Compile and implement a Solid Waste Management Plan. Waste management must be a priority and all waste must be collected, stored and disposed of adequately. It is recommended that all waste be removed from site on a weekly basis as a minimum.	Project manager, Environmental Officer	Operation

<b>Performance Indicator</b>	» Clearing restricted to 'allowable' areas, dust generated, limited unplanned fires, rehabilitation.
<b>Monitoring and Reporting</b>	» Daily during the operational phase for all mitigation

**OBJECTIVE 10: Prevent the direct and indirect loss and disturbance of faunal species and community (including potentially/occurring SCCs)**

<b>Project Component/s</b>	» Operations Area (PV Footprint, laydown areas and roads)
<b>Potential Impact</b>	» Ongoing displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, noise, light, dust, vibration)
<b>Activities/Risk Sources</b>	» Moving vehicles, Fire and human presence and activities



<b>Mitigation: Target/Objective</b>	» Avoidance / minimisation of the disturbance and degradation of vegetation.
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Mitigation: Action/Control	Responsibility	Timeframe
Outside lighting should be designed and limited to minimize impacts on fauna. Lighting fixtures should be fitted with baffles, hoods or louvres and directed downward. Outside lighting should be directed away from highly sensitive areas such as the wetlands. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible;	Project manager, Environmental Officer	Operation
Where feasible, motion detection lighting must be used to minimise the unnecessary illumination of areas.	Project manager, Environmental Officer	Operation
Minimise traffic and the use of vehicle lights of the road during the night.	Project manager, Environmental Officer	Operation
Noise must be kept to a minimum from dusk to dawn to minimize all possible disturbances to amphibian species and nocturnal mammals.	Project manager, Environmental Officer	Operation
Latest technology solar panels with an anti-reflective coating must be used. This will also improve the light transmittance and therefore increases the overall efficiency.	Project manager, Environmental Officer	Operation
If panels do not possess anti-reflective coatings, then non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun et al, 2021).	Project manager, Environmental Officer	Operation
All personnel and contractors must undergo Environmental Awareness Training and must include awareness about not harming or collecting species.	Project manager, Environmental Officer	Operation
Any fauna threatened by the maintenance and operational activities should be removed to a safe location by an appropriate individual.	Project manager, Environmental Officer	Operation
All vehicles accessing the site should adhere to a max 40 km/h max to avoid collisions. Appropriate signs must be erected.	Project manager, Environmental Officer	Operation
If any excavations are to be dug these must not be left open for more than a few hours without ramps for trapped fauna to leave and must be filled at night.	Project manager, Environmental Officer	Operation

<b>Performance Indicator</b>	» Amount of observable fauna mortalities, » Speed limits adhered to
<b>Monitoring and Reporting</b>	» Daily during the operational phase for all mitigation

**8.2. Monitoring Programme: Operation Phase of the solar energy facility.**

**OBJECTIVE 11: 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. An internal environmental audit must be conducted every 6 months and an external audit must be conducted once a year in order to confirm compliance with the requirements of all environmental permits (including the Environmental Authorisation, once issued) for the project, this EMPr, and all relevant legislation. The results of the audit reports must be made available to the GDARD and the relevant authorities on request, and must be part of monitoring and audit reports. An annual audit report must be compiled and submitted to GDARD. The aim of the 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 in the communication and feedback to authorities and stakeholders.

## CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING

The solar infrastructure which will be utilised for the Quantum 1 SEF is expected to have a lifespan of 25 years (with maintenance). Equipment associated with this solar 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 solar facility would comprise the dismantling and replacement of the solar panels with more appropriate technology/infrastructure available at that time. 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 EMP to be revisited and amended.

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

» **Site Preparation**

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

» **Dismantle and Remove Infrastructure**

The solar infrastructure (solar panels and mounting structures) of the solar facility will be dismantled once it reaches the end of its economic lifespan. Once dismantled, the components will be reused, recycled, or disposed of in accordance with regulatory requirements (NEMA / NEM:WA). All parts of the solar panels would be considered reusable or recyclable.

### 9.1. Objectives

**OBJECTIVE 1: Minimisation of visual impacts associated with Decommissioning**

<b>Project Component/s</b>	» The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, workshop, transformers, etc.).
<b>Potential Impact</b>	» Visual impact of residual visual scarring and vegetation rehabilitation failure.
<b>Activities/Risk Sources</b>	» The viewing of the above mentioned by observers on or near 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.

Mitigation: Action/Control	Responsibility	Timeframe
Remove infrastructure not required for the post-decommissioning use of the site.	Project proponent / operator	During the decommissioning phase.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.	Project proponent / operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Project proponent / 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.

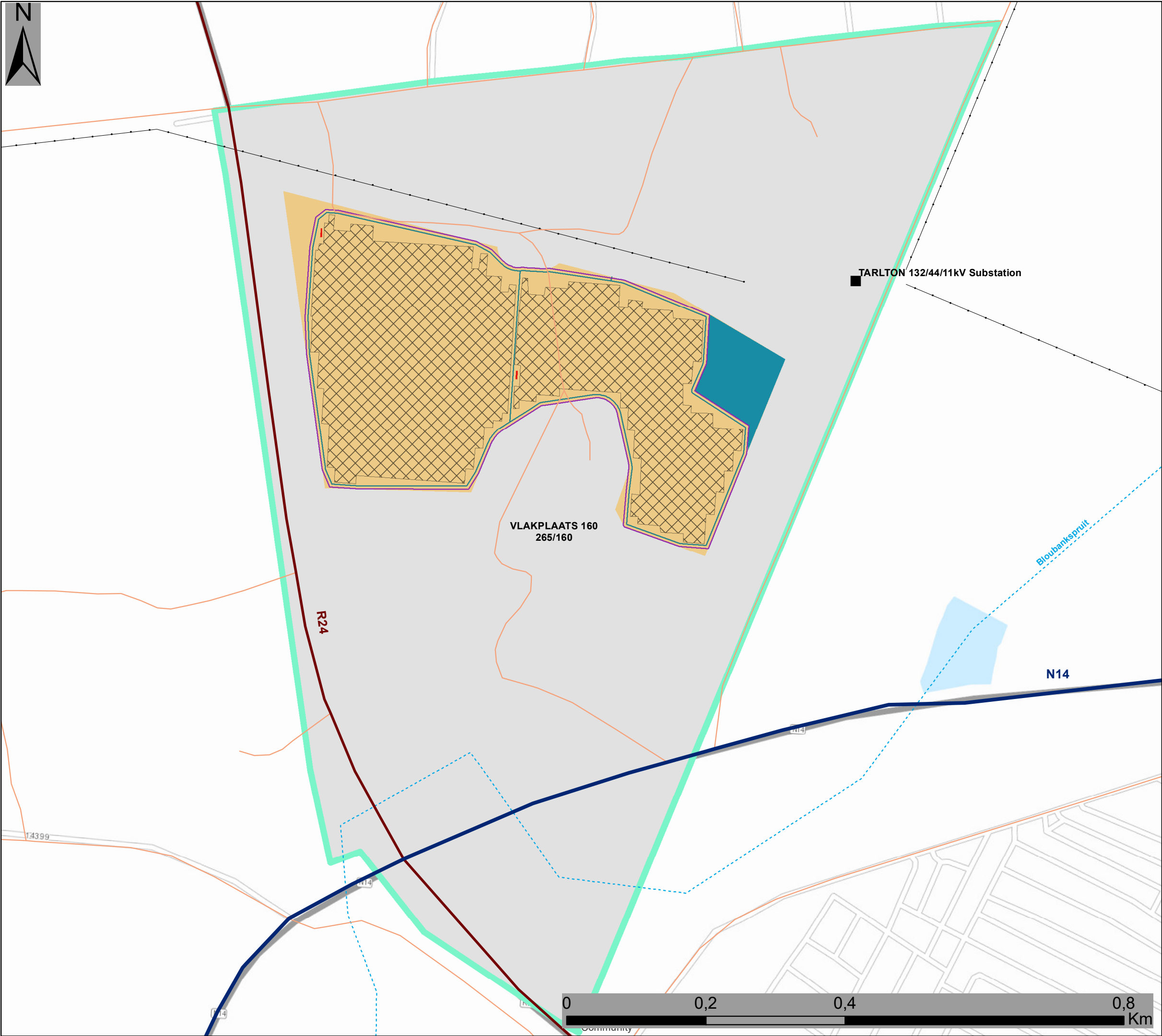
In decommissioning the Quantum 1 SEF, the Authorisation Holder must ensure that:

- » All structures not required for the post-decommissioning use of the site (may include the PV Panels, substation, ancillary buildings) are dismantled and/or demolished, removed and waste material disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.
- » Rehabilitate access/service roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.
- » All disturbed areas are compacted, sloped and contoured to ensure drainage and runoff and to minimise the risk of erosion.
- » Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.
- » Any fauna encountered during decommissioning activities should be removed to safety by a suitably qualified person.
- » All vehicles should adhere to a low speed limit on site.
- » All above-ground infrastructures should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan.
- » Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities.
- » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- » Decommissioning disturbance within or near the drainage lines should be kept to a minimum and any disturbance in these areas should be rehabilitated as quickly as possible.
- » An erosion monitoring programme should be put in place for at least 3 years after decommissioning and should make provision for annual monitoring and rehabilitation.
- » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- » There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area.
- » Alien management at the site should be implemented post-decommissioning in accordance with an Alien Invasive Management Plan.

- » Regular (annual) monitoring for alien plants during decommissioning to ensure that no alien invasive problems have developed as result of the disturbance, as per the Alien Management Plan for the project.
- » Woody aliens should be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present.
- » Retrenchments should comply with South African Labour legislation of the day.

The general specifications of Chapter 6 (Construction) and Chapter 7 (Rehabilitation) are also relevant to the decommissioning of the Quantum 1 SEF and must be adhered to.

**APPENDIX A:  
FACILITY LAYOUT AND SENSITIVITY MAPS**



# Quantum 1 Solar Energy Facility Gauteng Province Layout Map

## Legend

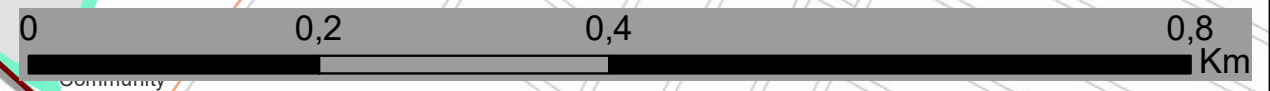
- Eskom Substation
- Existing Power Line
- National Route
- Regional Road
- Secondary Roads
- Perennial River
- Non-perennial River
- Quantum 1 Development Area
- Affected Property
- Development Footprint
- PV Arrays
- Facility Fence
- Internal Roads
- Power Stations
- Substation & Associated Infrastructure Footprint

## Proposed Development

- Quantum 1 Development Area
- Affected Property
- Development Footprint
- PV Arrays
- Facility Fence
- Internal Roads
- Power Stations
- Substation & Associated Infrastructure Footprint



Scale: 1:6 000  
 Projection: GCS\_WGS\_1984  
 Map Ref: Quantum 1 PV Layout Map



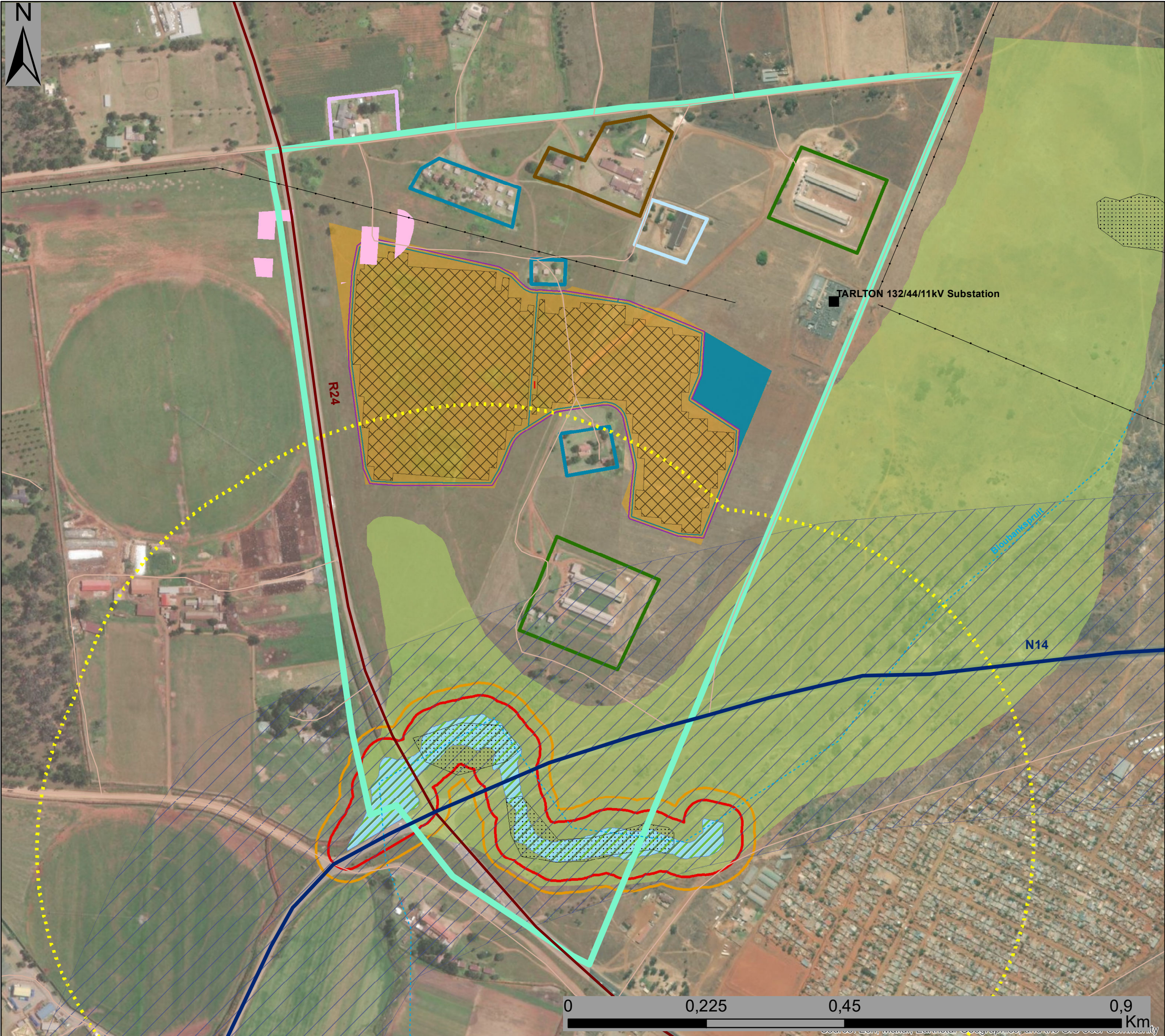




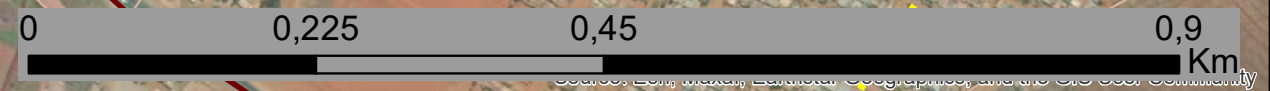
# Quantum 1 Solar Energy Facility Gauteng Province Sensitivity & Layout Map

## Legend

- Eskom Substation
- Existing Power Line
- Perennial River
- Non-perennial River
- Proposed Development**
- Quantum 1 Development
- Development Footprint
- PV Arrays
- Facility Fence
- Internal Roads
- Power Stations
- Substation & Associated Infrastructure
- Environmental Sensitivities**
- Ecological Sensitivities**
- CBA1 (Very High Ecological Sensitivity)
- Wetlands (No-Go Area)
- Wetland 30m Buffer (Very High Ecological Sensitivity)
- Wetland 50m Buffer (High Ecological Sensitivity)
- Wetland 500m Regulated Buffer
- Heritage Sensitivities**
- N14 250m Buffer (No-Go Area)
- Avifauna Sensitivities**
- African Grass Owl Habitat Suitability (No-Go Area)
- Soil Sensitivities**
- Glenrosa Soil (Medium Soil Sensitivity)
- Social Sensitivities**
- Eggcor Layer Farm
- Housing
- Light Centre for Children with Disabilities - Tarlton
- Poultry Farm Facility
- Quantum Foods - Hensnest



Scale: 1:7 000  
 Projection: GCS\_WGS\_1984  
 Map Ref: Quantum 1 PV Sensitivity & Layout Map





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

## GRIEVANCE MECHANISM / PROCESS

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### 1. PURPOSE

This Grievance Mechanism has been developed to receive and facilitate the resolution of concerns and grievances regarding the project's environmental and social performance. The aim of the Grievance Mechanism is to ensure that grievances or concerns raised by stakeholders are addressed in a manner that:

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

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

### 2. PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

The following proposed grievance procedures are to be complied with throughout the construction, operation and decommissioning phases of the project. These procedures should be updated as and when required to ensure that the Grievance Mechanism is relevant for the project and effective in providing the required processes.

- » Local landowners, communities and authorities must be informed in writing by the Developer of the grievance mechanism and the process by which grievances can be brought to the attention of the Developer through its designated representative. This must be undertaken with the commencement of the construction phase.
- » A company representative must be appointed as the contact person to which grievances can be directed. The name and contact details of the contact person must be provided to local landowners, communities and authorities when requested.
- » Project related grievances relating to the construction, operation and or decommissioning phases 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, by recording grievances and completing written grievance notices where applicable, translating requests or concerns or by facilitating contact with relevant parties who can address the raised concerns. The following information should be obtained, as far as possible, regarding each written grievance, which may act as both acknowledgement of receipt as well as record of grievance received:
  - a. The name and contact details of the complainant.
  - b. The nature of the grievance.
  - c. Date raised, received, and for which the meeting was arranged.
  - d. Persons elected to attend the meeting (which will depend on the grievance).
  - e. A clear statement that the grievance procedure is, in itself, not a legal process. Should such avenues be desired, they must be conducted in a separate process and do not form part of this grievance mechanism.
- » The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and, if required, agree on a suitable

date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.

- » The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed and only if required).
- » A grievance register must be kept on site (in electronic format, so as to facilitate editing and updating), and shall be made available to all parties wishing to gain access thereto.
- » Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting, as well as a suitable venue. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or Developer are entitled to invite their legal representatives to attend the meeting/s, it should be made clear to all the parties involved in the process that the grievance mechanism process is not a legal process, and that if the Complainant invites legal representatives, the cost will be their responsibility. It is therefore recommended that the involvement of legal representatives be limited as far as possible, as a matter of last resort, and that this process be primarily aimed at stakeholder relationship management as opposed to an arbitration or litigation mechanism.
- » The meeting should be chaired by the Developer's representative appointed to address grievances. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- » Draft copies of the minutes must be made available to the Complainant and the Developer within 5 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 5 working days of receipt of the draft minutes.
- » The meeting agenda must be primarily the discussion of the grievance, avoidance and mitigation measures available and proposed by all parties, as well as a clear indication of the future actions and responsibilities, in order to put into effect, the proposed measures and interventions to successfully resolve the grievance.
- » In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must 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 Developer regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
- » In the event that the parties agree to appoint a mediator, the Developer will be required to identify three (3) mediators and forward the names and Curriculum Vitae (CVs) to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Developer, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Developer. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- » In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the

measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

- » In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- » The draft report must be made available to the Complainant and the Developer for comment before being finalised and signed by all parties, which signature may not be unreasonably withheld by either party. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action is required, or indeed possible. Closure status must be classified and captured following mediation or successful resolution in the Complaints Register as follows:

- » Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
- » Unresolved. Complaints where it has not been possible to reach an agreed resolution despite mediation.
- » Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

**APPENDIX C:**  
**OPEN SPACE MANAGEMENT PLAN**

# ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

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## 1. PURPOSE

Invasive alien plant species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant and Open Space Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the proposed Quantum 1 Solar PV. The broad objectives of the plan include the following:

- » Ensure alien plants do not become dominant in parts of the site, or the whole site, through the control and management of alien and invasive species presence, dispersal and encroachment.
- » Develop and implement a monitoring and eradication programme for alien and invasive plant species.
- » Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

This plan should be updated throughout the lifecycle of the project, as required in order to ensure that appropriate measures are in place to manage and control the establishment of alien and invasive plant species and to ensure compliance with relevant legislation. This plan should be implemented with a specific focus on sensitive areas.

## 2. LEGISLATIVE CONTEXT

### ***Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)***

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

- » Category 1: Prohibited and must be controlled.
- » Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- » Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

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

The National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices GNR 506, 507, 508 and 509 of 2013 under NEM:BA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought, or sold without a permit. Below is an explanation of the three categories:

- » **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

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

The following guide is a useful starting point for the identification of alien plant species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien plant species that are regulated in terms of the CARA as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

### **3. ALIEN PLANT MANAGEMENT PRINCIPLES**

#### **3.1. Prevention and early eradication**

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

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species already on site, as well as those that are introduced to the site by the construction activities. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When additional Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

#### **3.2. Containment and control**

If any alien invasive plants are found to become established on-site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriately registered chemicals and other possible control agents should be considered in the action plans for each site/species. The use of chemicals is not recommended for any wetland areas. Herbicides should be applied directly to the plant and not to the soil. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least amount of energy and resources are required to maintain this status over the long term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

### 3.3. General Clearing and Guiding Principles

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably will not increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

#### i. Clearing Methods

Different species require different clearing methods such as manual, chemical, or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

#### » Mechanical control

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

#### » Chemical Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create an additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species that re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- \* Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- \* All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, products, and spray mixtures.
- \* Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of at a suitable site.
- \* To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- \* Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- \* The appropriate health and safety procedures should also be followed regarding the storage, handling, and disposal of herbicides.
- \* The use of chemicals is not recommended for wetland areas.



For all herbicide applications, the following Regulations and guidelines should be followed:

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

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

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, ARSRA. This is regulated by the Department of Agriculture, Forestry and Fisheries (DAFF).

» **Biological control**

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

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

### **3.4. General management practices**

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

- » Establish an ongoing monitoring programme for the construction phase to detect and quantify any alien species that may become established.
- » Alien vegetation regrowth on areas disturbed by construction must be immediately controlled.
- » Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- » Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these herbicides break down on contact with the soil. Residual herbicides should not be used.
- » The effectiveness of vegetation control varies seasonally, and this is also likely to impact alien species. Control early in the wet season will allow species to re-grow, and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control, and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no

exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.

- » Alien plant management is an iterative process, and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
- » Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
- » No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally occurring species should be used.
- » During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

### 3.5. Monitoring

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

In general, the following principles apply for monitoring:

- » Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- » Simple records must be kept of daily operations, e.g., area/location cleared, labour units and, if ever used, the amount of herbicide used.
- » It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

#### Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien plant species	Pre-construction Monthly during Summer and Autumn (Middle November to end of March) 3 Monthly during Winter and Spring
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien plant control measures implemented	Record of clearing activities	3 Monthly

**Operation Phase**

<b>Monitoring Action</b>	<b>Indicator</b>	<b>Timeframe</b>
Document alien plant species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Biannually
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

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

# REVEGETATION AND HABITAT REHABILITATION PLAN

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## 1. PURPOSE

The purpose of the Rehabilitation Plan is to ensure that areas cleared or impacted during construction activities within the development footprint for the Quantum 1 Solar PV that are not required for operation are rehabilitated to their original state before the operation phase commences, and that the risk of erosion from these areas is reduced. The purpose of the Rehabilitation Plan for the development footprint can be summarised as follows:

- » Achieve long-term stabilisation of all disturbed areas.
- » Re-vegetate all disturbed areas with suitable local plant species.
- » Minimise visual impact of disturbed areas.
- » Ensure that disturbed areas are rehabilitated to a condition similar to that found prior to disturbance.

This Rehabilitation Plan should be read in conjunction with other site-specific plans, including the Erosion Management Plan, Alien Invasive Management Plan and Plant Rescue and Protection Plan. Prior to the commencement of construction, a detailed Rehabilitation Plan and Method Statement for the site should be compiled with the aid of a suitably qualified, professionally registered specialist (with a botanical or equivalent qualification).

## 2. RELEVANT ASPECTS OF THE SITE

The survey area does not fall within an area demarcated as a centre of plant endemism. The dominant vegetation unit associated with the project area is Carletonville Dolomite Grassland, which forms part of the Dry Highveld Grassland bioregion within the Grassland biome. It is a vegetation unit classified as conservationally Least Concern (SANBI, 2022).

The nature of the proposed development, the level of transformation that has been imposed on the ecological features of the areas pertaining to the development footprint by historical and existing impacting drivers of ecological change means that the proposed project has limited relevance to the conservation of vegetation units within the region. Natural vegetation features have a patchy occurrence within the survey property and is too limited in spatial extent to warrant formal conservation.

The watercourse is dominated on its northern outer riparian zones by exotic vegetation, which is presumably from soil disturbances induced by the historical farming practices that occurred on the site to the adjacent north. This area is still utilised for informal dumping of rubble, building materials, and some domestic and garden refuse, which is presumably from the residents from the surrounding area that opportunistically utilise this site for that purpose. There also has seemingly been a degree of landscaping, where it is presumed that the adjacent grassland area to the north was historically subject to a degree of levelling that encroached into the outer riparian zones. Any form of soil disturbances would induce alien vegetation encroachment. Besides annual exotic weeds such as *Tagetes minuta*, exotic trees dominate the zone, with *Acacia baileyana*, *Acacia dealbata*, *Acacia decurrens*, *Cereus jamacaru*, *Opuntia ficus-indica* and *Solanum mauritianum* being dominant. Pioneer grasses, such as *Cynodon dactylon*, are a prominent feature within the outer riparian zones, whereas the exotic pioneer species, namely *Pennisetum clandestinum* (kikuyu)

forms a prominent feature of the inner riparian zones on both the northern and southern banks of the watercourse.

This area makes up most of the area that is proposed as the site for the bulk of the PV infrastructure. Historical aerial imagery indicates that the area once accommodated what seems like staff quarters and other infrastructure, which has since been demolished and the rubble largely removed. There are still reminiscent foundation materials within the site. Historically this area would have been subject to vegetation removal, and, with the removal of the infrastructure, there seemed to have been limited rehabilitation undertaken to restore the vegetation. The result of this is that the area is dominated by pioneering grasses and annual alien species. Species such as the alien kikuyu (*Pennisetum clandestinum*) and the indigenous pioneer grass, *Cynodon dactylon*, dominate the grass components, together with *Agrostis montevidensis*. *Tagetes minuta* (Kaki weed), various *Conyza* species (Fleabane) and a variety of other annual weed species dominate the area. The site supports limited ecological processes due to the impacts that emanate from the historical land use.

Maintained grassland areas are those areas that are routinely mowed and maintained and makes up the bulk of the grassland zones that are associated with all the existing infrastructure. Besides for aesthetic purposes, maintenance of the grass area that surround the infrastructure would be part of a fire management strategy, and to avert predators that may prey on the chickens. Due to the routine maintenance, these areas are subject to routine disturbances created from the mowing process. Rocks, termite mounds and other ecological features would have been removed for ease of maintenance. These areas provide very limited cover and, if any forb species occur, they would be mowed over before getting a chance to flower and produce seeds. This would be true also for most of the grasses. This means that the seedbank becomes depleted over time and the area becomes less and less ecologically sustainable. The mowing the grass meant that flowering individuals were largely absent, which lowered the confidence level of positive identifications.

### 3. REHABILITATION METHODS AND PRACTICES

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

Clearing of invaded areas should be conducted as per the Alien Management Plan, included in the Environmental Management Programme (EMPr).

- » No harvesting of vegetation may be undertaken outside the area to be disturbed by construction activities.
- » Indigenous plant material must be kept separate from alien material.
- » Indigenous seeds may be harvested for purposes of revegetation in areas that are free of alien invasive vegetation, either at the project area prior to clearance or from suitable neighbouring sites.
- » Topsoil should be reserved wherever possible on the project area, to be utilised during rehabilitation.
- » Sods used for revegetation should be obtained directly from the project area, but not from the sensitive areas. Sods should contain at least a 50mm topsoil layer and be minimally disturbed, in particular to existing root systems. Sods must ideally be obtained from areas as close as possible to the region that is to be rehabilitated.
- » Water used for the irrigation of re-vegetated areas should be free of chlorine and other pollutants that might have a detrimental effect on the plants.
- » All seeded, planted, or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals.

- » On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.
- » In areas where soil saver is used, it should be pegged down to ensure that it captures soil and organic matter flowing over the surface.
- » The final rehabilitated area should resemble the current composition and structure of the soil as far as practicably possible.
- » Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible.
- » No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been rehabilitated.
- » Where rehabilitation sites are located within actively grazed areas, they should be fenced off, this must be undertaken in consultation with the landowner.
- » Any runnels, erosion channels or wash-aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.
- » Re-vegetated areas should be monitored frequently. Where signs of inadequate surface coverage are evident after two growing seasons, re-vegetation should be done from scratch. Adequate recovery must be assessed by a qualified botanist or rehabilitation specialist.
- » The stockpiled vegetation from the clearing operations should be reduced to mulch where possible and retained along with topsoil to encourage seed bank regrowth and soil fertility.
- » Mulches must be collected in such a manner as to restrict the loss of seed.
- » Mulch must be stored for as short a period as possible.
- » Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants.
- » Where herbicides are used to clear vegetation, species-specific chemicals should be applied to individual plants only. General spraying should be strictly prohibited, and only the correct herbicide type should be applied.
- » Once rehabilitated, areas should be protected to prevent trampling and erosion.
- » Fencing should be removed once a sound vegetative cover has been achieved.
- » On completion of construction, the surface of any work areas, especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- » A site survey that focuses on the success rates of rehabilitated areas and identification of further areas that would benefit from rehabilitation should be undertaken during the construction phase and again upon completion of the construction phase before the contractor has left the site so that recommendations can be implemented. A report detailing the ecological trend analysis should be submitted upon completion of each survey period. The report should also include an audit of the mitigation strategies in place to abate the impacts to the ecological processes and provide measures and recommendations to improve on the processes (if applicable).

#### **4. MONITORING AND FOLLOW-UP ACTION**

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of rehabilitated areas. During the construction phase, the Environmental Office (EO) and Engineering, Procurement and Construction (EPC) Contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is

operational, the Developer / O&M Operator will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- » Associated nature and stability of surface soils.
- » Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately, as per the alien management plan and mitigation measures contained within the EMPr.

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

- » Rehabilitated areas should be monitored (responsibility of the EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.
- » Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e., have increased runoff and a decreased infiltration rate) increasing the erosion potential.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the timeframe between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control and rehabilitation strategy.
- » Any areas showing erosion, should be adaptively managed with particular erosion control measures, depending on the extent of the erosion.

If the current state of the environment prior to construction (which will be disturbed during the construction phase) is not achieved post impact, within the specified rehabilitation period, maintenance of these areas must continue until an acceptable state is achieved (excluding alien plant species or weeds). Additional rehabilitation methods may be necessary to achieve the current state before construction commenced.

Monitoring of the rehabilitation success, as well as follow-up adaptive management, combined with the clearing of emerging alien plant species should all continue for as long as is considered necessary, depending on regrowth rates.



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

# PLANT RESCUE AND PROTECTION PLAN

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## 1. PURPOSE

The purpose of the Search and Rescue and Protection Plan is to implement avoidance and mitigation measures, in addition to the mitigations included in the Environmental Management Programme (EMPr) to reduce the impact of the establishment of the Solar PV Energy Facility on listed and protected plant species and their habitats during construction and operation. This subplan is required in order to ensure compliance with national and provincial legislation for vegetation clearing and any required destruction or translocation of provincially and nationally protected species within the development area and grid connection corridor.

The Plan first provides some legislative background on the regulations relevant to listed and protected species, under the Threatened or Protected Species (TOPS) Regulations, the Transvaal Nature Conservation Ordinance 12 of 1983, and trees protected under the National Forests Act: List of Protected Tree Species. This is followed by an identification of protected species present within the development area and actions that should be implemented to minimise impact on these species and comply with legislative requirements.

## 2. IDENTIFICATION OF SPECIES OF CONSERVATION CONCERN

Plant species are protected at the national level as well as the provincial level and different permits may be required for different species depending on their protection level. At the national level, protected trees are listed by the Department of Forestry, Fisheries and the Environment (DFFE) under the National Forests Act: List of Protected Trees, which is updated on a regular basis. Any clearing of nationally protected trees requires a permit from DFFE. At the provincial level, all species red-listed under the Red List of South African plants (<http://redlist.sanbi.org/>) as well as species listed under the Free State Nature Conservation Ordinance 8 of 1969 are protected and require provincial permits. Transvaal Nature Conservation Ordinance 12 of 1983 lists a variety of species as protected but also several whole families and genera as protected.

## 3. IDENTIFICATION OF LISTED SPECIES

Two floral SCC were noted to be relevant to the project area from the Screening Tool Assessment, namely *Dicliptera magaliesbergensis* (Acanthaceae) and *Melolobium subspicatum* (Fabaceae). Both species are listed as Vulnerable. A localised distribution range coupled to ongoing destruction of habitat due to urbanisation, road development, and general urban sprawl factors are quoted as the main reasons for the decline of these species. Neither of these species were noted during the field survey. It is also highly unlikely that either of these species would occur within the survey property due to the relatively transformed status of the habitat. The wetland area and the mandatory conservation buffer zones have been included within an ecological sensitivity map that also includes the eastern boundary areas where natural grasslands and a rocky ridge extend to the north and northeast of the site, and within the area that is designated as a CBA1 priority conservation zone.

The SANBI POSA database was utilised to see if any protected tree species (that are nationally protected under the NFA) have been recorded from the survey area. It should be noted that a permit to remove or destroy protected species must be sought from the national authority (DFFE) prior to the removal or destruction of these species. There were no species indicated or noted during the field survey and therefore there will be no impact to protected tree species due to the proposed development.

#### **4. MITIGATION & AVOIDANCE OPTIONS**

The primary mitigation and avoidance measure that must be implemented at the pre-construction phase is the pre-construction walk-through of the development area and grid connection corridor. This defines which and how many individuals of listed and protected species are found within the development area and grid connection corridor. This information is required for the permits which must be obtained before construction can commence.

Where listed species fall within the development area and grid connection corridor and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development area and grid connection corridor. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well and it is generally not recommended to try and attempt to translocate such species. Recommendations in this regard would be made following the walk-through of the development area and grid connection corridor before construction, where all listed and protected species within the development area and grid connection corridor will be identified and located.

#### **5. RESCUE AND PROTECTION PLAN**

##### **5.1. Pre-construction**

- » Identification of all listed species which may occur within the development area and grid connection corridor, based on the South African National Biodiversity Institute (SANBI) POSA database as well as the specialist study for the development area and grid connection corridor and any other relevant literature.
- » Before construction commences at the development area and grid connection corridor, the following actions should be taken:
  - A walk-through of the development area and grid connection corridor by a suitably qualified botanist/ecologist to locate and identify all listed and protected species that fall within the project area. This should happen during the flowering season at the development area and grid connection corridor which, depending on rainfall, is likely to be during spring to early summer (August-October).
  - A walk-through report following the walk-through which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species must be compiled. The report should also contain a full list of localities where listed species occur within the development area and grid connection corridor and the number of affected individuals in each instance so that this information can be used to comply with the permit conditions required by the relevant legislation. Those species suitable for search as rescue should be identified in the walk-through report.
  - A permit to clear the site and relocate species of concern is required from Gauteng Department of Agriculture and Rural Development (GDARD) before construction commences. A tree clearing permit is also required from DFFE to clear protected trees from the site.
  - Once the permits have been issued, there should be a search and rescue operation of all listed species that cannot be avoided, which have been identified in the walk-through report as being suitable for search and rescue within the development area and grid connection corridor. Affected individuals should be translocated to a similar habitat outside of the development area and grid connection corridor and marked for monitoring purposes.

## 5.2. Construction

- » Vegetation clearing should take place in a phased manner so that large cleared areas are not left standing with no activity for long periods of time and pose a wind and water erosion risk. This will require coordination between the contractor and Environmental Officer (EO), to ensure that the EO is able to monitor activities appropriately.
- » All cleared material should be handled according to the Revegetation and Rehabilitation Plan and used to encourage the recovery of disturbed areas.
- » The EO should monitor vegetation clearing at the development area and grid connection corridor. Any deviations from the plans that may be required should first be checked for listed species by the EO and any listed species present which are able to survive translocation should be translocated to a safe site.
- » All areas to be cleared should be demarcated with construction tape, survey markers or similar. All construction vehicles should work only within the designated area.
- » Plants suitable for translocation or for use in the rehabilitation of already cleared areas should be identified and relocated before general clearing takes place.
- » Any listed species observed within the development area and grid connection corridor that were missed during the pre-construction plant sweeps should be translocated to a safe site before clearing commences.
- » Many listed species are also sought after for traditional medicine or by collectors and so the EO and Environmental Control Officer (ECO) should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed.
- » The EO should monitor construction activities in sensitive habitats such as in dune areas carefully to ensure that impacts to these areas are minimised.

## 5.3. Operation

- » Access to the development area should be strictly controlled and all personnel entering or leaving the development area should be required to sign in and out with the security officers.
- » The collecting of plants or their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the development area.

## 6. MONITORING & REPORTING REQUIREMENTS

The following reporting and monitoring requirements are recommended as part of the plant rescue and protection plan:

- » Pre-construction walk-through report detailing the location and distribution of all listed and protected species must be compiled. This should include a walk-through of all infrastructure including all new access roads, cables, buildings and substations. The report should include recommendations of route adjustments where necessary, as well as provide a full account of how many individuals of each listed species will be impacted by the development. Details of plants suitable for search and rescue must also be included.
- » Permit applications to GDARD and DFFE. This requires the walk-through report as well as the identification and quantification of all listed and protected species within the development area. The permit is required before any search and rescue or vegetation clearance can take place. Where large numbers of listed species are affected, a site inspection and additional requirements may be imposed by GDARD and DFFE as part of the permit conditions. All documentation associated with this process needs to be retained and the final clearing permit should be kept at the development area.

- » Active daily monitoring of clearing during construction by the EO must be undertaken to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented.
- » Post-construction monitoring of plants translocated during search and rescue to evaluate the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.



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

## **TRAFFIC AND TRANSPORTATION GUIDING PRINCIPLES**

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### **1. PURPOSE**

The purpose of this Traffic and Transportation Management Guide is to address regulatory compliance, traffic management practices, and protection measures to help reduce impacts related to transportation and the construction of temporary and long-term access within the vicinity of the Quantum 1 Solar PV development area. The objectives of these guiding principles include the following:

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

### **2. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES**

- » Prior to the commencement of construction, the contractor must develop a detailed Transport Management Plan (TMP) based on relevant traffic volumes and road carry capacity.
- » The transport contractor must ensure that all required permits for the transportation of abnormal loads are in place prior to the transportation of equipment and project components to the project area. Specific abnormal load routes must be developed with environmental factors taken into consideration.
- » Before construction commences, authorised access routes must be clearly marked in the field with signs or flagging. The Construction Contractor must review the location of designated access and will be responsible for ensuring construction travel is limited to designated routes.
- » All employees must attend an environmental training program (e.g., toolbox talks) by the Environmental Officer (EO). Through this program, employees will be instructed to use only approved access roads, drive within the delineated road limits, and obey jurisdictional and posted speed limits to minimise potential impacts to the environment and other road users.
- » The contractor will be responsible for making sure that their suppliers, vendors, and subcontractors strictly comply with the principles of this TMP and the contractor's TMP.
- » Adjacent landowners must be notified of the construction schedule.
- » Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.
- » Signs must be posted in the project area to notify landowners and others of the construction activity.
- » Flagging must be provided at access points to the site and must be maintained until construction is completed on the site.
- » Speed limits must be established prior to commencement of construction and enforced over all construction traffic.
- » Speed controls and implementation of appropriate dust suppression measures must be enforced to minimise dust pollution.

- » Throughout construction, the contractor will be responsible for monitoring the condition of roads used by project traffic and for ensuring that roads are maintained in a condition that is comparable to the condition they were in before the construction began.
- » Drivers must have an appropriate valid driver's license and other operation licences required by applicable legislation.
- » All vehicles must be maintained in good mechanical, electrical, and electronic condition, including but not limited to the brake systems, steering, tires, windshield wipers, side mirrors and rear-view mirror, safety belts, signal indicators, and lenses.
- » Any traffic delays attributable to construction traffic must be co-ordinated with the appropriate authorities.
- » No deviation from approved transportation routes must be allowed unless roads are closed for reasons outside the control of the contractor.
- » Impacts on local communities must be minimised. Consideration where possible should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.

### **3. MONITORING**

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



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

# STORMWATER AND EROSION MANAGEMENT PLAN

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## 1. PURPOSE

By taking greater cognisance of natural hydrological patterns and processes, it is possible to develop storm water management systems in a manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate storm water management are increased erosion risk and risks associated with flooding. Therefore, this Stormwater Management Guide and the Erosion Management Plan are closely linked to one another and should be managed together.

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

- » Topography and slope gradients.
- » Placing of infrastructure and infrastructure design.
- » Annual average rainfall.
- » Rainfall intensities.

The objective of these guiding principles is therefore to provide measures to address runoff from disturbed portions of the development area, such that they:

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

This Stormwater Management Guide must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

## 2. RELEVANT ASPECTS OF THE SITE

The desktop review indicated the land use within the area to be dominated by agriculture (active cultivation) with a growing population due to an expanding informal residential area located near to the project site. There is a wastewater treatment works located upstream of the site that releases processed effluent into the watercourse that runs through the southern section of the site. The survey property is currently being utilised as an active chicken farm enterprise. The wetland unit has suffered varying degrees of transformation and ecological degradation due to both local and catchment pressures and drivers of ecological change.

The Screening Tool Assessment and Site Verification showed that the actual proposed development footprint falls within an area classified as Low ecological sensitivity, with only the watercourse and associated wetland zones that associate with the southern boundary area of the larger property being assigned a Very high ecological sensitivity. The proposed development activities therefore only associate with the area zoned as being of Low ecological sensitivity.

The general Present Ecological State (PES) of the wetland unit associated with the site calculated to represent a D ecological category. The watercourse was also evaluated as an aquatic system, which resulted in an E/F ecological category for the SASS5 survey. Only one individual of an alien fish species was sampled, which then also translates to an E/F category for fish. The *in-situ* water quality results showed that all the parameters tested for remained within acceptable limits excepting for a low oxygen level that could be regarded as unsustainable to supporting a diversity of aquatic biota.

The application of the DWS Risk Assessment Matrix indicated that an overall low risk to the wetland unit is assumed for any activities associated with the proposed development. This is largely due to the infrastructure footprint being located some distance from the wetland area. The impacting features that were identified, however, could be lowered with the implementation of proposed mitigation measures. The overall impact significance of the proposed development activities to surface water ecosystems within the area is insignificant.

### 3. STORMWATER MANAGEMENT PRINCIPLES

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

- » Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
- » Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, and silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
- » Silt traps must be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Construction of gabions and other stabilisation features on steep slopes may be undertaken to prevent erosion, if deemed necessary.
- » Minimise the area of exposed bare soils to minimise the erosive forces of wind, water and all forms of traffic.
- » Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
- » Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
- » Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.
- » Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
- » Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
- » Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development stormwater flow should not exceed the capacity of the culvert. To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a 2-3% cross fall back into the slope, allowing stormwater to be channelled in a controlled manner towards the natural drainage lines and to assist with any sheet flow on the project area.

- » Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert.
- » Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
- » Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by stormwater must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or re-vegetation of the area. Any inlet to a piped system should be fitted with a screen or grating to prevent debris and refuse from entering the stormwater system.
- » Preferably all drainage channels on the project area and contained within the larger area of the property (i.e., including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

### **3.1. Engineering Specifications**

Detailed engineering specifications for a Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of this Stormwater Management Guide. This should include erosion control measures. Requirements for project design include:

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

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

An operation phase Stormwater Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

## PRINCIPLES FOR EROSION MANAGEMENT

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### 1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this Erosion Management Plan, the Storm water Management Plan and the Revegetation and Habitat Rehabilitation Plan are closely linked to one another and should not operate independently but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

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

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

This plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

### 2. RELEVANT ASPECTS OF THE SITE

Three soil forms were identified throughout the 50 m regulated area namely Hutton, Kimberley and Glenrosa, with the Glenrosa soil form being the most dominant form. Hard rock patches together with disturbed soil forms, due to building rubble, were also identified within the 50 m regulated area (GN 3201) as well as a stream which mostly indicates hydromorphic soil conditions due to seasonal or permanent water flows. These hydromorphic soils were mostly dominated by the Glenrosa soil form characterised with gleylic conditions associated to water saturation.

The Hutton and Kimberley soil forms are regarded to be most important in the study area as they demonstrate the most sensitive land capabilities. The Hutton soil form consists of an orthic topsoil horizon on top of a thick red apedal horizon. The Kimberley soil form has an orthic topsoil with a red apedal subsurface horizon with a soft carbonate horizon below.

The most sensitive land capability of the above mentioned soils has been determined to be class "II". A climate capability level 8 has been assigned to the area given the low Mean Annual Precipitation and the high Mean Annual Potential Evapotranspiration (MAPE) rates. By using the determined land capability for the most sensitive soil and the determined climate capability, a land potential of "L5" was calculated. According to Smith (2006), the "L5" land potential level is characterised by restricted potential. Regular and/or moderate to severe limitations are expected due to soil, slope, temperatures or rainfall.

All areas where vegetation is removed from the soil surface in preparation for the Solar PV facility construction, will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk. Once the soil particles are removed, vegetation will have difficulty establishing itself on the rock and lithic material in the area.

Soil erosion is a frequent risk associated with solar facilities on account of the vegetation clearing and disturbance associated with the construction phase of the development and may continue occurring throughout the operation phase. All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction will result in exposed soil surfaces that will be prone to erosion.

During the operation phase, the areas where vegetation was cleared will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the project area.

### **3. EROSION AND SEDIMENT CONTROL PRINCIPLES**

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

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

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

#### **3.1. On-Site Erosion Management**

General factors to consider regarding erosion risk at the project area include the following:

- » Reduction of a stable vegetation cover and associated below-ground biomass that currently increases soil surface porosity, water infiltration rates and thus improves the soil moisture availability. Without the vegetation, the soil will be prone to extensive surface capping, leading to accelerated erosion and further loss of organic material and soil seed reserves from the local environment.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
- » The extent of disturbance will influence the risk and consequences of erosion. Therefore, site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
- » Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
- » Where necessary, new roads constructed should include water diversion structures with energy dissipation features present to slow and disperse the water into the receiving area.
- » Roads used for project-related activities and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » Runoff may have to be specifically channelled or storm water adequately controlled to prevent localised rill and gully erosion.
- » Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.

- » All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
- » Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Gabions and other stabilisation features must be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
- » Activity at the project area after large rainfall events when the soils are wet and erosion risk is increased should be reduced. No driving off of hardened roads should occur at any time, and particularly immediately following large rainfall events.
- » Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities. Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.
- » Regular monitoring of the project area for erosion problems during construction (on-going) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The Environmental Control Officer (ECO) will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

### 3.1.1 Erosion control mechanisms

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

- » Reno mattresses.
- » Slope attenuation.
- » Hessian material.
- » Shade catch nets.
- » Gabion baskets.
- » Silt fences.
- » Storm water channels and catch pits.
- » Soil bindings.
- » Geofabrics.
- » Hydro-seeding and/or re-vegetating.
- » Mulching over cleared areas.
- » Boulders and size varied rocks.
- » Tilling.

## 3.2 Engineering Specifications

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

- » Erosion control measures to be implemented before and during the construction period, including the final storm water control measures (post construction).
- » All temporary and permanent water management structures or stabilisation methods must be indicated within the Storm water Management Plan.

- » An on-site Engineer or EO/ Safety, Health and Environment (SHE) Representative to be responsible for ensuring implementation of the erosion control measures on the project area during the construction period. The ECO should monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- » The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved Storm water Management Plan is not correctly or appropriately implemented and damage to the environment is caused.

### **3.3 Monitoring**

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

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

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

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

## **3 CONCLUSION**

The Erosion Management Plan is a document to assist the Proponent/ EPC Contractor with guidelines on how to manage erosion during all phases of the project. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the Environmental Management Programme (EMPr) and is required to be considered and adhered to during the design, construction, operation, and decommissioning phases of the project (if and where applicable). During the construction phase, the contractor must prepare an Erosion Control Method Statement to ensure that all construction methods adopted on the project area do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of this plan are met before, during and after construction. The designated responsible person on the project area, must be indicated in the Method Statement and shall ensure that relevant erosion control measures are in place throughout the construction phase.



An operation phase Erosion Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.



**APPENDIX H:  
WASTE MANAGEMENT PLAN**

# WASTE MANAGEMENT PLAN

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## 1. PURPOSE

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

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and is based on waste stream information available at the time of compilation. Construction and operation activities must be assessed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be updated once further detail regarding waste quantities and categorisation become available, during the construction and/or operation stages. This plan should be updated throughout the lifecycle of the Quantum 1 Solar PV, as required, in order to ensure that appropriate measures are in place to manage and control waste and to ensure compliance with relevant legislation.

Prior to the commencement of construction, a detailed Waste Management Method Statement for the project should be compiled by the Contractor.

## 2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of the Quantum 1 Solar PV will generate construction solid waste, general waste and hazardous waste during the lifetime of the facility.

Waste generated originates from various sources, including but not limited to:

- » Concrete waste generated from spoil and excess concrete.
- » Contaminated water, soil, rocks, and vegetation due to hydrocarbon spills.
- » Hazardous waste from vehicle, equipment and machinery parts and servicing, fluorescent tubes, used hydrocarbon containers, and waste ink cartridges.
- » Recyclable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, Polyvinyl chloride (PVC), Low-density polyethylene (LDPE)) and cardboard.
- » Organic waste from food waste as well as alien and endemic vegetation removal.
- » Sewage from portable toilets.
- » Inert waste from spoil material from site clearance and trenching works.

### 2.1 Panel Cleaning

It is anticipated that the PV panels will be washed four times a year during operation. Only clean water (i.e., with no cleaning products), or non-hazardous biodegradable cleaning products, will be utilised for the washing of panels. Wastewater generated by washing panels will be collected and recycled for future use, or alternatively, in the event that an environmentally friendly non-hazardous biodegradable cleaning product is utilised, wastewater can be allowed to run-off under the panels.

## 2.2 Effluent and Wastewater

During the construction and operation phases, mobile chemical toilets or a conservancy tank will be placed within the development area for use by contractors. These facilities will be maintained and serviced regularly by an appropriate waste contractor. Any other effluent discharge during construction and operation will be collected in sealed containers/tanks and collected by a registered service provider (i.e., the Local Municipality/Contractor) to be disposed of at an approved facility off-site.

Alternatively, employees may be requested to utilise existing ablution facilities in close proximity to the PV Facility.

## 2.3 Waste

All waste generated on site will be handled in accordance with the contractor's Waste Management Plan. Solid waste generated during construction will mainly be in the form of construction material, excavated substrate and domestic solid waste. Cardboard waste will be produced from panel packaging, which will be compacted on site prior to removal. Other wastes include rubber caps on panel edges, wooden pallets, and plastic wrapping (all related to the panel packaging). Waste will be disposed of in either waste skips and/or scavenger proof recycling bins (where possible) and temporarily placed in a central location for removal by an appropriate contractor. Where possible, waste will be recycled. Non-recyclable solid construction waste will be temporarily held in skips or other appropriate waste containers to be disposed of at an appropriately licensed landfill site. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility.

During construction, use of the following hazardous substances is anticipated: paint, grease, petrol / diesel for trucks, cranes, bulldozers etc. Limited amounts of transformer oils and chemicals will be used. Dangerous goods required to be stored during construction (e.g., limited quantities of fuel, oil, lubricants etc.) will be stored in compliance with relevant legislation (i.e., stored on covered and bunded areas / bin, and disposed of at a registered hazardous waste site). Hazardous waste will be appropriately stored and disposed of.

## 3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by several regulations, including:

- » National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008).
- » National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014).
- » The South African Constitution (Act 108 of 1996).
- » Hazardous Substances Act (Act 5 of 1973).
- » Health Act (Act 63 of 1977).
- » Environment Conservation Act (Act 73 of 1989).
- » Occupational Health and Safety Act (Act 85 of 1993).
- » National Water Act (Act 36 of 1998).
- » The National Environmental Management Act (Act 107 of 1998) (as amended).
- » Municipal Structures Act (Act 117 of 1998).
- » Municipal Systems Act (Act 32 of 2000).
- » Mineral and Petroleum Resources Development Act (Act 28 of 2002).
- » Air Quality Act (Act 39 of 2004).

Storage of waste must be conducted in accordance with the National Norms and Standards for the Storage of Waste, published in Government Notice Regulation (GNR) 926.

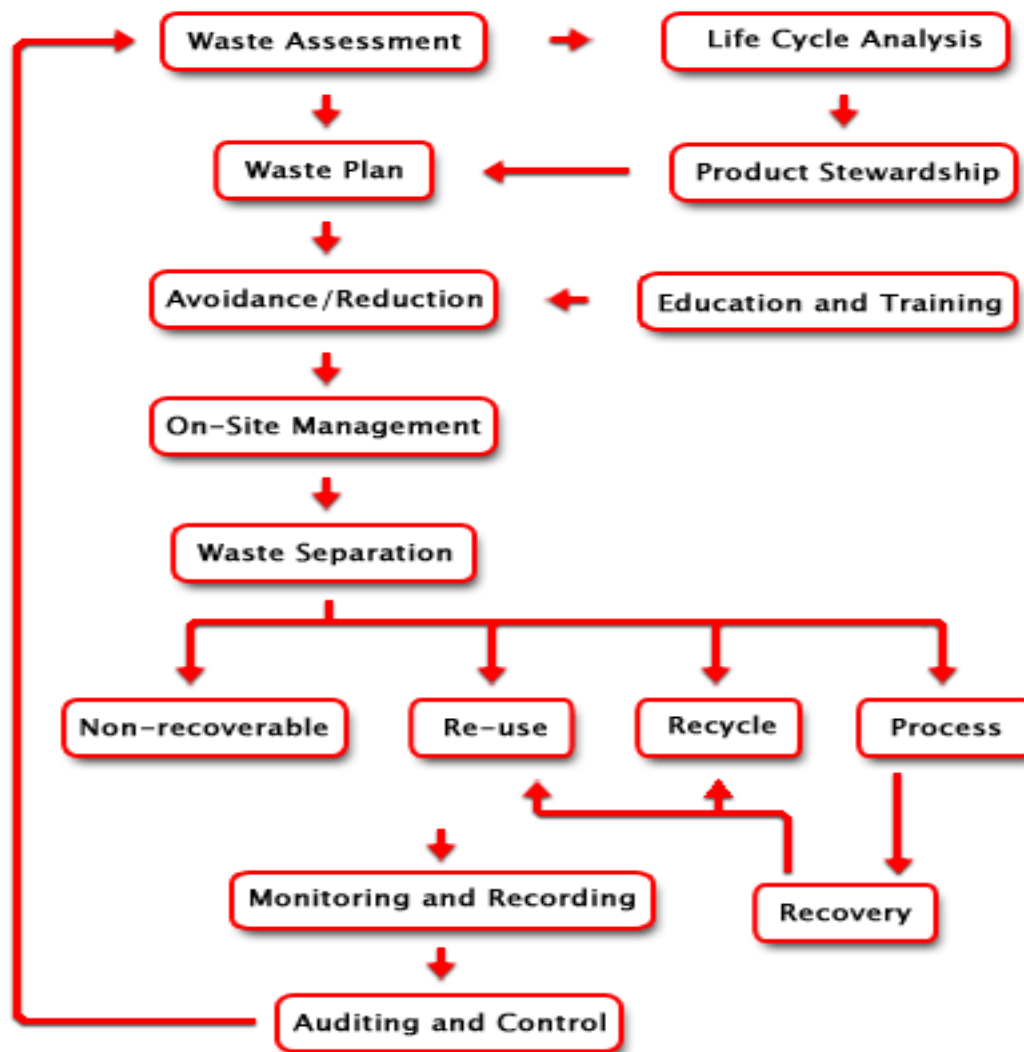
#### 4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management is needed on site. Such an approach is illustrated in **Figure 1**.

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

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

#### The Integrated Waste Management Approach to Waste



**Figure 1: Integrated Waste Management Flow Diagram**

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

#### **4.1. Construction phase**

A plan for the management of waste during the construction phase is detailed below. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction, for approval by the Resident Engineer.

##### **4.1.1. Waste Assessment / Inventory**

- » The Environmental Officer (EO), or designated staff member, must develop, implement, and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- » Construction methods and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities, to be pro-actively implemented.
- » Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- » The EO must conduct waste classification and rating in terms of South African National Standard (SANS) 10288 and Government Notice 634 published under the NEM: WA.

##### **4.1.2. Waste collection, handling, and storage**

- » It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e., separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors.
- » Waste manifests and waste acceptance approvals (i.e., receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- » Portable toilets must be monitored by the EO or responsible subcontractor and maintained regularly.
- » Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at strategic locations around the site for the storage of organic, recyclable, and hazardous waste.
- » A dedicated waste area must be established on the project area for the storage of all waste streams before removal from area. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- » Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e., paper, cardboard, metals, food waste, glass etc.).
- » Hazardous waste must be stored within a bunded area constructed according to South African Bureau of Standards (SABS) requirements and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity, and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank.
- » Take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.
- » Treat interconnected tanks as a single tank of equivalent total volume for the purposes of the bund design criteria.
- » The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an

additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.

- » Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- » A dedicated waste management team must be appointed by the principal contractors' Safety, Health and Environment (SHE) Officer, who will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the SHE Officer.
- » All waste removed from site must be done by a registered/ licensed subcontractor, who must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.

#### **4.1.3. Management of waste storage areas**

- » Waste storage must be undertaken in accordance with the relevant Norms and Standards.
- » The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and contaminated storm water.
- » Collection bins placed around the project area and at subcontractors' camps (if at a different location than the main site camp) must be maintained and emptied on a regular basis by the principal contractor to avoid overflowing receptacles.
- » Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked, or colour coded and well-maintained. Monitor for rodents and take corrective action if they become a problem.
- » Waste must be stored in designated containers and not on the ground.
- » Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls.
- » It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil/water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- » If any leaks occur in the bund, these must be amended immediately.
- » Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- » Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- » No mixing of hazardous and general waste is allowed.

#### **4.1.4. Disposal**

- » Waste generated on the project area must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process, however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.
- » Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and Environmental Control Officer (ECO).

#### **4.1.5. Record keeping**

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

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

#### **4.1.6. Training**

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

### **4.2. Operation phase**

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

The following waste management principles apply during the operation phase:

- » The SHE Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
- » Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
- » Recyclable waste must be removed from the waste stream and stored separately.
- » All waste must be stored in appropriate temporary storage containers (separated between different operation wastes and contaminated or wet waste).
- » Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
- » Waste generated on site must be removed on a regular basis throughout the operation phase.
- » Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

### **5. Monitoring of Waste Management Activities**

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



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

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must form part of the EO's reports to the ECO on a monthly basis.

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

# EMERGENCY PREPAREDNESS, RESPONSE AND FIRE MANAGEMENT PLAN

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## 1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

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

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of the construction phase detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC Performance Standard 1 and include the following:

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

## 2. PROJECT-SPECIFIC DETAILS

A preferred development area with an extent of ~94.1479ha has been identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd as technically suitable for the development of the Quantum 1 Solar Energy Facility. The facility will comprise the following infrastructure:

- » Solar PV array comprising solar modules.
- » Mounting System Technology
- » Inverters and transformers.
- » Low voltage cabling between the PV modules to the inverters.
- » Overhead power lines

- » Onsite substation, switching substation and laydown areas.
- » Battery Energy Storage System (BESS) and associated infrastructure.
- » Internal access roads.
- » Fence around the project development areas.

<b>Panel Height</b>	<b>Height: ~up to 5m from ground level (installed).</b>
Technology	Static or Tracking Photovoltaic Systems Bifacial or monofacial
Contracted Capacity	Up to 10MWac
Area occupied by the solar array	Up to 19.99ha
Area occupied by the on-site facility substation	Up to 0.2ha falling within a 1.5Ha area reserved for the substation and all associated infrastructures
Capacity of on-site facility substation	11kV onsite substation
Cabling between the PV array and the onsite substation	Up to 11kV underground cabling
Coordinates of on-site facility substation	26° 4'8.74"S 27°39'5.80"E (centre coordinates)
Battery Energy Storage System (BESS)	Capacity to be confirmed. The BESS will fall within the footprint reserved for the substation and associated infrastructure.
Extent of areas required for laydown of materials, equipment etc.	Will fall within the 1.5ha area reserved for the substation, BESS and all associated infrastructures.
Access and internal roads	Existing roads will be used as far as possible. There are existing gravel roads that can be utilized for site access (width of up to 6m). Upgrading of existing roads or new roads may be required.
Grid connection	To be evacuated from the onsite substation via 11kV Monopole or lattice structure pylons to the Eskom Tarlton 132/44/11kV substation located on the same land parcel as the proposed PV facility. This will form part of a separate EA process.
Temporary infrastructure	Will fall within the 1.5ha area reserved for the substation, BESS and all associated infrastructures.

Due to the scale and nature of this development, it is anticipated that the following risks could potentially arise during the construction and operation phases:

- » Fires.
- » Leakage of hazardous substances.
- » Storage of flammable materials and substances.
- » Flood events.
- » Accidents.
- » Natural disasters.

### 3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

- » Local Emergency: An alert confined to a specific locality.
- » Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.

- » Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

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

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

### **3.1. Emergency Scenario Contingency Planning**

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

##### **i. Spill Prevention Measures**

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

- » All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed/contained or bunded designated areas.
- » All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
- » No refuelling, storage, servicing, or maintenance of equipment should take place within sensitive environmental resources in order to reduce the risk of contamination by spills.
- » No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
- » Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
- » If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- » Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.
- » Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

##### **ii. Procedures**

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

1. Spill or release identified.

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

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

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

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

**Containment of Spills on Land**

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

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

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

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

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

### **c) Procedures for restoring affected areas**

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

#### **3.1.2. Scenario: Fire (and fire water handling)**

##### **i. Action Plan**

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

1. Quantify risk.
2. Assess person safety, safety of others and environment.
3. If safe – attempt to extinguish the fire using appropriate equipment.
4. If not safe to extinguish, contain fire.
5. Notify the Site Manager and emergency response crew and authorities.
6. Inform users of the potential risk of fire.
7. Record the incident on the company database or filing register.

##### **ii. Procedures**

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

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

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

##### **a) Procedures for initial actions**

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

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

##### **b) Reporting procedures**

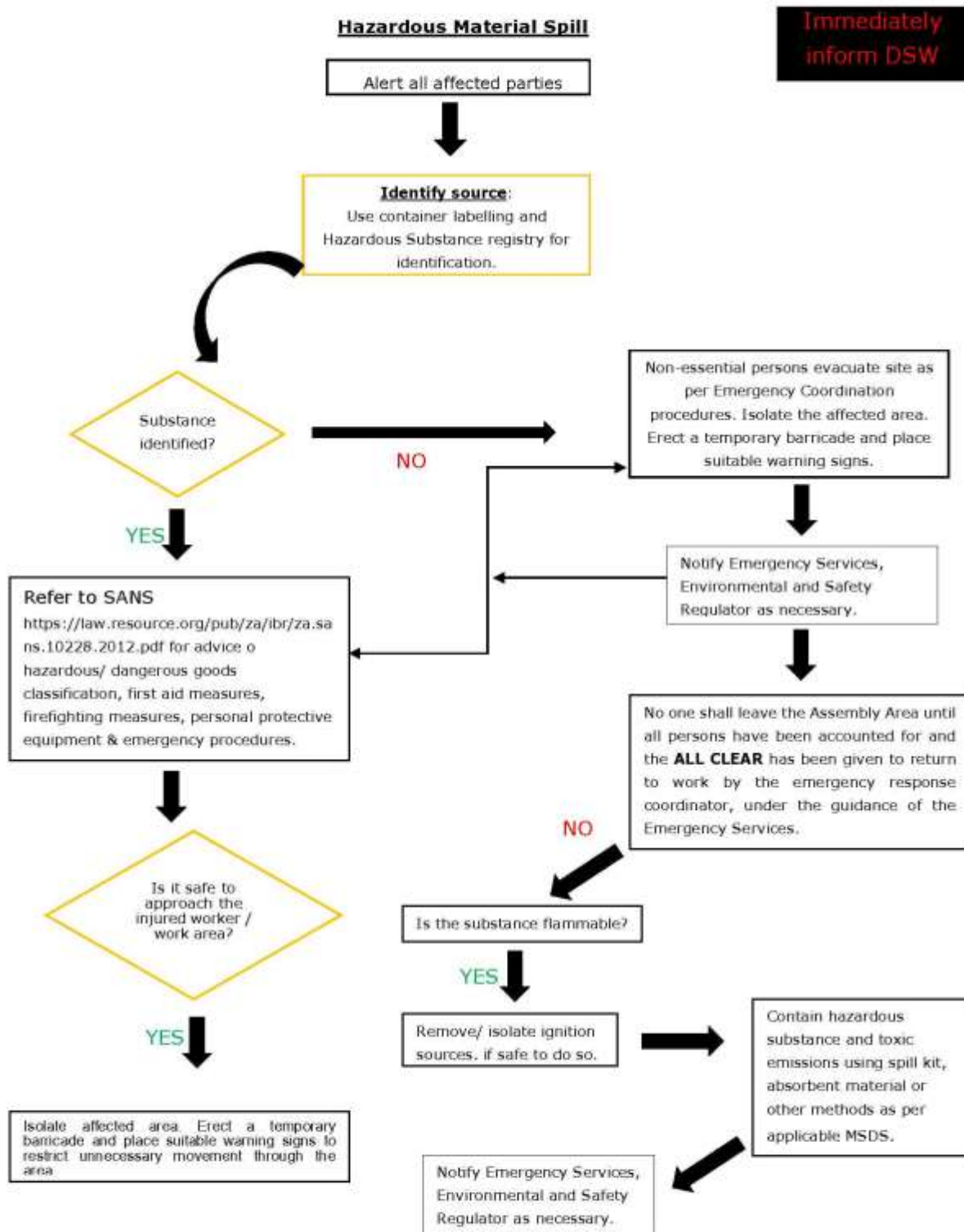
In terms of the requirements of National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), the responsible person must, within 14 days of the incident, report to the Director General, provincial head of department and municipality.

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

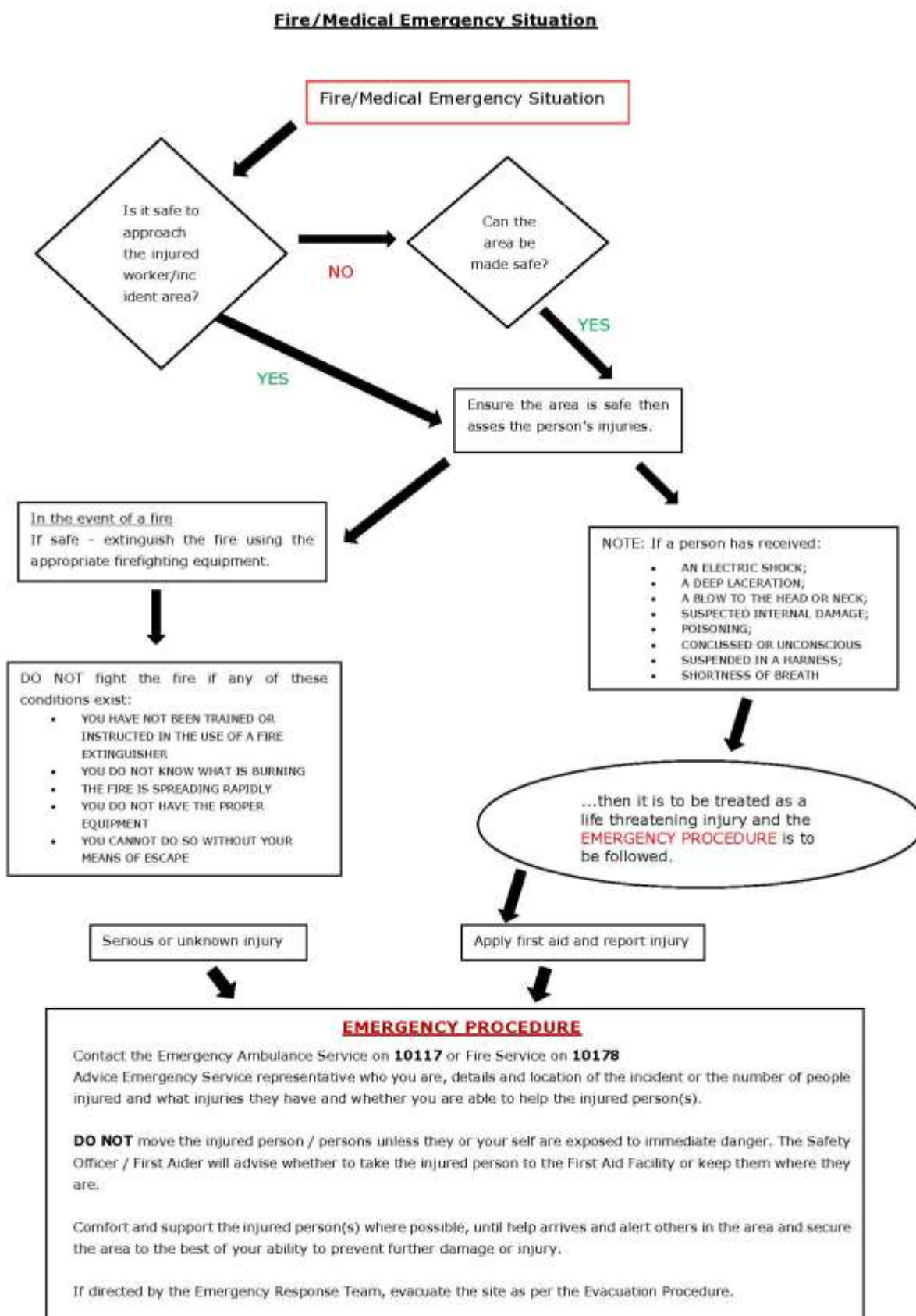




**SUMMARY: RESPONSE PROCEDURE**



**Figure 1:** Hazardous Material Spill



**Figure 2:** Emergency Fire/Medical

#### **4. PROCEDURE RESPONSIBILITY**

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

The local authorities will provide their assistance when deemed necessary, or when it has been requested and/or indicated in Section 30 (8) of NEMA. The provincial authority will provide assistance and guidance where required and conduct awareness programmes.



**APPENDIX J:  
CHANCE FINDS PROCEDURE**



## **CHANCE FINDS OF PALAEOLOGICAL MATERIAL**

*(Adopted from the HWC Chance Fossils Finds Procedure: June 2016)*

### **Introduction**

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

### **Training**

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO. It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.



### **Actions to be taken**

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent. Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including:
  - The date
  - A description of the discovery
  - A description of the fossil and its context (e.g. position and depth of find)
  - Where and how the find has been stored
  - Photographs to accompany the preliminary report (the more the better):
    - A scale must be used
    - Photos of location from several angles
    - Photos of vertical section should be provided
    - Digital images of hole showing vertical section (side);
    - Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.



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- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collect with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

**CTS Heritage**

34 Harries Street, Plumstead, Cape Town, 7800

**Tel:** +27 (0)87 073 5739 **Email:** [info@ctsheritage.com](mailto:info@ctsheritage.com) **Web:** [www.ctsheritage.com](http://www.ctsheritage.com)



CTS HERITAGE

FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM		
Name of project:		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	<i>Lat:</i>	<i>Long:</i>
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole		
Photographs (tick as appropriate and indicate number of the photograph)	<i>Digital image of vertical section (side)</i>	
	<i>Fossil from different angles</i>	
	<i>Wider context of the find</i>	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil Name:		
Contact:		
Recorder Name:		
Contact:		
Photographer Name:		
Contact:		

CTS Heritage

34 Harries Street, Plumstead, Cape Town, 7800

Tel: +27 (0)87 073 5739 Email: info@ctsheritage.com Web: www.ctsheritage.com



**APPENDIX  
CURRICULUM VITAE OF THE PROJECT TEAM**

**K:**

## CURRICULUM VITAE OF JO-ANNE THOMAS

<b>Profession:</b>	Environmental Management and Compliance Consultant; Environmental Assessment Practitioner
<b>Specialisation:</b>	Environmental Management; Strategic environmental advice; Environmental compliance advice & monitoring; Environmental Impact Assessments; Policy, strategy & guideline formulation; Project Management; General Ecology
<b>Work experience:</b>	Twenty five (25) years in the environmental field

### VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Key focus on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Undertaking of numerous environmental management studies has resulted in a good working knowledge of environmental legislation and policy requirements. Recent projects have been undertaken for both the public- and private-sector, including compliance advice and monitoring, electricity generation and transmission projects, various types of linear developments (such as National Road, local roads and power lines), waste management projects (landfills), mining rights and permits, policy, strategy and guideline development, as well as general environmental planning, development and management.

### SKILLS BASE AND CORE COMPETENCIES

- Project management for a range of projects
- Identification and assessment of potential negative environmental impacts and benefits through the review and manipulation of data and specialist studies
- Identification of practical and achievable mitigation and management measures and the development of appropriate management plans
- Compilation of environmental reports in accordance with relevant environmental legislative requirements
- External and peer review of environmental reports
- Compliance advice and monitoring
- Formulation of environmental policies, strategies and guidelines
- Strategic and regional assessments; pre-feasibility & site selection
- Public participation processes
- Environmental Due Diligence and Assurance
- Strategic environmental advice to a wide variety of clients both in the public and private sectors
- Working knowledge of environmental planning processes, policies, regulatory frameworks and legislation

## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- B.Sc Earth Sciences, University of the Witwatersrand, Johannesburg (1993)
- B.Sc Honours in Botany, University of the Witwatersrand, Johannesburg (1994)
- M.Sc in Botany, University of the Witwatersrand, Johannesburg (1996)

### Short Courses:

- Environmental Impact Assessment, Potchefstroom University (1998)
- Environmental Law, Morgan University (2001)
- Environmental Legislation, IMBEWU (2017)
- Mining Legislation, Cameron Cross & Associates (2013)
- Environmental and Social Risk Management (ESRM), International Finance Corporation (2018)

### Professional Society Affiliations:

- Registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA) (2019/726)
- Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: Environmental Scientist (400024/00)
- Registered with the International Association for Impact Assessment South Africa (IAIASa): 5601
- Member of the South African Wind Energy Association (SAWEA)

## EMPLOYMENT

Date	Company	Roles and Responsibilities
January 2006 - Current:	Savannah Environmental (Pty) Ltd	Director Project manager Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor.
1997 – 2005:	Bohlweki Environmental (Pty) Ltd	Senior Environmental Scientist at. Environmental Management and Project Management
January – July 1997:	Sutherland High School, Pretoria	Junior Science Teacher

## PROJECT EXPERIENCE

Project experience includes large infrastructure projects, including electricity generation and transmission, wastewater treatment facilities, mining and prospecting activities, property development, and national roads, as well as strategy and guidelines development.

## RENEWABLE POWER GENERATION PROJECTS: PHOTOVOLTAIC SOLAR ENERGY FACILITIES

### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Christiana PV 2 SEF, North West	Solar Reserve South Africa	Project Manager & EAP
De Aar PV facility, Northern Cape	iNca Energy	Project Manager & EAP
Everest SEF near Hennenman, Free State	FRV Energy South Africa	Project Manager & EAP
Graafwater PV SEF, Western Cape	iNca Energy	Project Manager & EAP
Grootkop SEF near Allanridge, Free State	FRV Energy South Africa	Project Manager & EAP
Hertzogville PV 2 SEF with 2 phases, Free State	SunCorp / Solar Reserve	Project Manager & EAP
Karoshhoek CPV facility on site 2 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Kgabalatsane SEF North-East for Brits, North West	Built Environment African Energy Services	Project Manager & EAP
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy Global	Project Manager & EAP
Lethabo Power Station PV Installation, Free State	Eskom Holdings SoC Limited	Project Manager & EAP
Majuba Power Station PV Installation, Mpumalanga	Eskom Holdings SoC Limited	Project Manager & EAP
Merapi PV SEF Phase 1 – 4 South-East of Excelsior, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Sannaspos Solar Park, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Ofir-Zx PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Oryx SEF near Virginia, Free State	FRV Energy South Africa	Project Manager & EAP
Project Blue SEF North of Kleinsee, Northern Cape	WWK Development	Project Manager & EAP
S-Kol PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Sonnenberg PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Tutuka Power Station PV Installation, Mpumalanga	Eskom Transmission	Project Manager & EAP
Two PV sites within the Northern Cape	MedEnergy Global	Project Manager & EAP
Two PV sites within the Western & Northern Cape	iNca Energy	Project Manager & EAP
Upington PV SEF, Northern Cape	MedEnergy Global	Project Manager & EAP
Vredendal PV facility, Western Cape	iNca Energy	Project Manager & EAP
Waterberg PV plant, Limpopo	Thupela Energy	Project Manager & EAP
Watershed Phase I & II SEF near Litchtenburg, North West	FRV Energy South Africa	Project Manager & EAP
Alldays PV & CPV SEF Phase 1, Limpopo	BioTherm Energy	Project Manager & EAP
Hyperion PV Solar Development 1, 2, 3, 4, 5 & 6, Northern Cape	Building Energy	Project Manager & EAP
Vrede & Rondavel PV, Free State	Mainstream Renewable Energy Developments	Project Manager & EAP
3 x PV facilities for Sibanye Stillwater Mines, North West Province	Sibanye Stillwater	Project Manager & EAP
Pixley PV Facilities (x4), Northern Cape	Mulilo	Project Manager & EAP
Middelvlei PV Facility, Gauteng Province	Middelvlei Solar	Project Manager & EAP
Buffelspoort PV Facility, North West Province	Buffelspoort Solar	Project Manager & EAP
Kwana PV Facility, Northern Cape	Great Karoo Renewable Energy (Pty) Ltd	Project Manager & EAP
Nku PV Facility, Northern Cape	Great Karoo Renewable Energy (Pty) Ltd	Project Manager & EAP
Moriri PV Facility, Northern Cape	Great Karoo Renewable Energy (Pty) Ltd	Project Manager & EAP
Additional footprint for the Sannaspos PV Facility, Free State Province	Engie Solar	Project Manager & EAP
Additional footprint for the Grootspuit PV Facility, Free State Province	Engie Solar	Project Manager & EAP
Additional footprint for Graspan PV Facility, Northern Cape	Engie Solar	Project Manager & EAP
2 x PV Facilities for Siyanda Mine, Northam, Limpopo	Siyanda Platinum	Project Manager & EAP
Zondereinde PV Facility, Limpopo Province	Northam Platinum	Project Manager & EAP
Umbila Emoyeni PV Facility, Mpumalanga Province	Windlab	Project Manager & EAP
4 x Mutsho PV facilities, Limpopo Province	Mutsho Solar	Project Manager & EAP
9 x Crossroads Energy PV Facilities, Northern Cape	Crossroads Energy	Project Manager & EAP

Project Name & Location	Client Name	Role
Limestone PV1 and PV2, Northern Cape	AGV Renewable Energy	Project Manager & EAP

#### Basic Assessments

Project Name & Location	Client Name	Role
Aberdeen PV SEF, Eastern Cape	BioTherm Energy	Project Manager & EAP
Christiana PV 1 SEF on Hartebeestpan Farm, North-West	Solar Reserve South Africa	Project Manager & EAP
Heuningspruit PV1 & PV 2 facilities near Koppies, Free State	Sun Mechanics	Project Manager & EAP
Kakamas PV Facility, Northern Cape	iNca Energy	Project Manager & EAP
Kakamas II PV Facility, Northern Cape	iNca Energy	Project Manager & EAP
Machadodorp 1 PV SEF, Mpumalanga	Solar To Benefit Africa	Project Manager & EAP
PV site within the Northern Cape	iNca Energy	Project Manager & EAP
PV sites within 4 ACSA airports within South Africa, National	Airports Company South Africa (ACSA)	Project Manager & EAP
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo2 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo3 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo4 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
Sannaspos PV SEF Phase 2 near Bloemfontein, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Solar Park Expansion within the Rooiwal Power Station, Gauteng	AFRKO Energy	Project Manager & EAP
Steynsrus SEF, Free State	SunCorp	Project Manager & EAP
Sirius Solar PV Project Three and Sirius Solar PV Project Four (BA in terms of REDZ regulations), Northern Cape	SOLA Future Energy	Project Manager & EAP
Northam PV, Limpopo Province	Northam Platinum	Project Manager & EAP
Kolkies PV Suite (x 6 projects) and Sadawa PV Suite (x 4 projects), Western Cape	Mainstream Renewable Energy Developments	Project Manager & EAP
Sun Garden PV, Eastern Cape Province	Sun Garden (Pty) Ltd	Project Manager & EAP
Solaris Fields PV, Eastern Cape	Solaris Fields (Pty) Ltd	Project Manager & EAP
Red Sands PV1, PV2 and PV3, Northern Cape	AGV Renewable Energy	Project Manager & EAP

#### Screening Studies

Project Name & Location	Client Name	Role
Allemans Fontein SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Amandel SEF near Thabazimbi, Limpopo	iNca Energy	Project Manager & EAP
Arola/Doornplaat SEF near Ventersdorp, North West	FRV & iNca Energy	Project Manager & EAP
Bloemfontein Airport PV Installation, Free State	The Power Company	Project Manager & EAP
Brakspruit SEF near Klerksorp, North West	FRV & iNca Energy	Project Manager & EAP
Carolus Poort SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Damfontein SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Everest SEF near Welkom, Free State	FRV & iNca Energy	Project Manager & EAP
Gillmer SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Grootkop SEF near Allansridge, Free State	FRV & iNca Energy	Project Manager & EAP
Heuningspruit PV1 & PV 2 near Koppies, Free State	Cronimat	Project Manager & EAP
Kimberley Airport PV Installation, Northern Cape	The Power Company	Project Manager & EAP
Kolonnade Mall Rooftop PV Installation in Tshwane, Gauteng	Momentous Energy	Project Manager & EAP
Loskop SEF near Groblersdal, Limpopo	S&P Power Unit	Project Manager & EAP

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Marble SEF near Marble Hall, Limpopo	S&P Power Unit	Project Manager & EAP
Morgenson PV1 SEF South-West of Windsorton, Northern Cape	Solar Reserve South Africa	Project Manager & EAP
OR Tambo Airport PV Installation, Gauteng	The Power Company	Project Manager & EAP
Oryx SEF near Virginia, Free State	FRV & iNca Energy	Project Manager & EAP
Rhino SEF near Vaalwater, Limpopo	S&P Power Unit	Project Manager & EAP
Rustmo2 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
Spitskop SEF near Northam, Limpopo	FRV & iNca Energy	Project Manager & EAP
Steynsrus PV, Free State	Suncorp	Project Manager & EAP
Tabor SEF near Polokwane, Limpopo	FRV & iNca Energy	Project Manager & EAP
Upington Airport PV Installation, Northern Cape	The Power Company	Project Manager & EAP
Valeria SEF near Hartebeestpoort Dam, North West	Solar to Benefit Africa	Project Manager & EAP
Watershed SEF near Lichtenburg, North West	FRV & iNca Energy	Project Manager & EAP
Witkop SEF near Polokwane, Limpopo	FRV & iNca Energy	Project Manager & EAP
Woodmead Retail Park Rooftop PV Installation, Gauteng	Momentous Energy	Project Manager & EAP

#### **Environmental Compliance, Auditing and ECO**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
ECO and bi-monthly auditing for the construction of the Adams Solar PV Project Two South of Hotazel, Northern Cape	Enel Green Power	Project Manager
ECO for the construction of the Kathu PV Facility, Northern Cape	REISA	Project Manager
ECO and bi-monthly auditing for the construction of the Pulida PV Facility, Free State	Enel Green Power	Project Manager
ECO for the construction of the RustMo1 SEF, North West	Momentous Energy	Project Manager
ECO for the construction of the Sishen SEF, Northern Cape	Windfall 59 Properties	Project Manager
ECO for the construction of the Upington Airport PV Facility, Northern Cape	Sublanary Trading	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Kathu PV facility, Northern Cape	REISA	Project Manager
ECO for the construction of the Konkoonsies II PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
ECO for the construction of the Aggeneys PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager

#### **Compliance Advice and ESAP Reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Aggeneys Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Airies II PV Facility SW of Kenhardt, Northern Cape	BioTherm Energy	Environmental Advisor
Kalahari SEF Phase II in Kathu, Northern Cape	Engie	Environmental Advisor
Kathu PV Facility, Northern Cape	Building Energy	Environmental Advisor
Kenhardt PV Facility, Northern Cape	BioTherm Energy	Environmental Advisor
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Environmental Advisor
Konkoonsies II SEF near Pofadder, Northern Cape	BioTherm Energy	Environmental Advisor
Konkoonsies Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Lephalale SEF, Limpopo	Exxaro	Environmental Advisor
Pixley ka Seme PV Park, South-East of De Aar, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Environmental Advisor
Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Environmental Advisor
Sirius PV Plants, Northern Cape	Aurora Power Solutions	Environmental Advisor
Upington Airport PV Power Project, Northern Cape	Sublunary Trading	Environmental Advisor
Upington SEF, Northern Cape	Abengoa Solar	Environmental Advisor
Ofir-ZX PV SEF near Keimoes, Northern Cape	Networx S28 Energy	Environmental Advisor
Environmental Permitting for the Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Environmental Advisor
Environmental Permitting for the Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Environmental Advisor

### **Due Diligence Reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
5 PV SEF projects in Lephalale, Limpopo	iNca Energy	Environmental Advisor
Prieska PV Plant, Northern Cape	SunEdison Energy India	Environmental Advisor
Sirius Phase One PV Facility near Upington, Northern Cape	Aurora Power Solutions	Environmental Advisor
Mogalakwena PV Facility, Limpopo Province	Pele Green Energy	Environmental Advisor

### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Biodiversity Permit & WULA for the Aggeneys SEF near Aggeneys, Northern Cape	BioTherm Energy	Project Manager & EAP
Biodiversity Permit for the Konkoonises II SEF near Pofadder, Northern Cape	BioTherm Energy	Project Manager & EAP
Biodiversity Permitting for the Lephalale SEF, Limpopo	Exxaro Resources	Project Manager & EAP
Environmental Permitting for the Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Project Manager & EAP
Environmental Permitting for the Upington SEF, Northern Cape	Abengoa Solar	Project Manager & EAP
Environmental Permitting for the Kathu PV Facility, Northern Cape	Building Energy	Project Manager & EAP
Environmental Permitting for the Konkoonises Solar Farm, Northern Cape	BioTherm Energy	Project Manager & EAP
Environmental Permitting for the Lephalale SEF, Limpopo	Exxaro Resources	Project Manager & EAP
Environmental Permitting for the Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Project Manager & EAP
Environmental Permitting for the Sirius PV Plant, Northern Cape	Aurora Power Solutions	Project Manager & EAP
Environmental Permitting for the Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Environmental Permitting for the Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Permits for the Kleinbegin and UAP PV Plants, Northern Cape	MedEnergy Global	Project Manager & EAP



<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
S53 Application for Arriesfontein Solar Park Phase 1 – 3 near Danielskuil, Northern Cape	Solar Reserve / SunCorp	Project Manager & EAP
S53 Application for Hertzogville PV1 & PV 2 SEFs, Free State	Solar Reserve / SunCorp	Project Manager & EAP
S53 Application for the Bloemfontein Airport PV Facility, Free State	Sublunary Trading	Project Manager & EAP
S53 Application for the Kimberley Airport PV Facility, Northern Cape	Sublunary Trading	Project Manager & EAP
S53 Application for the Project Blue SEF, Northern Cape	WWK Developments	Project Manager & EAP
S53 Application for the Upington Airport PV Facility, Free State	Sublunary Trading	Project Manager & EAP
WULA for the Kalahari SEF Phase II in Kathu, Northern Cape	Engie	Project Manager & EAP

### **RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)**

#### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Ilanga CSP 2, 3, 4, 5, 7 & 9 Facilities near Upington, Northern Cape	Emvelo Holdings	Project Manager & EAP
Ilanga CSP near Upington, Northern Cape	Ilangethu Energy	Project Manager & EAP
Ilanga Tower 1 Facility near Upington, Northern Cape	Emvelo Holdings	Project Manager & EAP
Karoshhoek CPVPD 1-4 facilities on site 2 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Karoshhoek CSP facilities on sites 1.4; 4 & 5 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Karoshhoek Linear Fresnel 1 Facility on site 1.1 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP

#### **Environmental Compliance, Auditing and ECO**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
ECO for the construction of the !Khi CSP Facility, Northern Cape	Abengoa Solar	Project Manager
ECO for the construction of the Ilanga CSP 1 Facility near Upington, Northern Cape	Karoshhoek Solar One	Project Manager
ECO for the construction of the Solar Park, Northern Cape	Kathu Solar	Project Manager
ECO for the construction of the KaXu! CSP Facility, Northern Cape	Abengoa Solar	Project Manager
Internal audit of compliance with the conditions of the IWUL issued to the Karoshhoek Solar One CSP Facility, Northern Cape	Karoshhoek Solar One	Project Manager



## Screening Studies

Project Name & Location	Client Name	Role
Upington CSP (Tower) Plant near Kanoneiland, Northern Cape	iNca Energy and FRV	Project Manager & EAP

## Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Environmental Advisor
Ilangalethu CSP 2, Northern Cape	FG Emvelo	Environmental Advisor
Kathu CSP Facility, Northern Cape	GDF Suez	Environmental Advisor
Lephalale SEF, Limpopo	Cennergi	Environmental Advisor
Solis I CSP Facility, Northern Cape	Brightsource	Environmental Advisor

## Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Environmental Permitting for the Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Project Manager & EAP
Environmental Permitting for the Kathu CSP, Northern Cape	GDF Suez	Project Manager & EAP
WULA for the Solis I CSP Facility, Northern Cape	Brightsource	Project Manager & EAP

## RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Sere WEF, Western Cape	Eskom Holdings SoC Limited	EAP
Aberdeen WEF, Eastern Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Amakhala Emoyeni WEF, Eastern Cape	Windlab Developments	Project Manager & EAP
EXXARO West Coast WEF, Western Cape	EXXARO Resources	Project Manager & EAP
Goereesoe Wind Farm near Swellendam, Western Cape	iNca Energy	Project Manager & EAP
Hartneest WEF, Western Cape	Juwi Renewable Energies	Project Manager & EAP
Hopefield WEF, Western Cape	Umoya Energy	EAP
Kleinsee WEF, Northern Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Klipheuwel/Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Project Manager & EAP
Moorreesburg WEF, Western Cape	iNca Energy	Project Manager & EAP
Oyster Bay WEF, Eastern Cape	Renewable Energy Resources Southern Africa	Project Manager & EAP
Project Blue WEF, Northern Cape	Windy World	Project Manager & EAP
Rheboksfontein WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Spitskop East WEF near Riebeeck East, Eastern Cape	Renewable Energy Resources Southern Africa	Project Manager & EAP
Suurplaat WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Swellendam WEF, Western Cape	IE Swellendam	Project Manager & EAP
Tsitsikamma WEF, Eastern Cape	Exxarro	Project Manager & EAP
West Coast One WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Umbila WEF, Mpumalanga	Windlab	Project Manager & EAP
Merino WEF, Northern Cape	Great Karoo Renewable Energy (Pty) Ltd	Project Manager & EAP

## Basic Assessments

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Amakhala Emoyeni Wind Monitoring Masts, Eastern Cape	Windlab Developments	Project Manager & EAP
Beaufort West Wind Monitoring Masts, Western Cape	Umoya Energy	Project Manager & EAP
Hopefield Community Wind Farm near Hopefield, Western Cape	Umoya Energy	Project Manager & EAP
Koekenaap Wind Monitoring Masts, Western Cape	EXXARO Resources	Project Manager & EAP
Koingnaas WEF, Northern Cape	Just Palm Tree Power	Project Manager & EAP
Laingsburg Area Wind Monitoring Masts, Western Cape	Umoya Energy	Project Manager & EAP
Overberg Area Wind Monitoring Masts, Western Cape	BioTherm Energy	Project Manager & EAP
Oyster Bay Wind Monitoring Masts, Eastern Cape	Renewable Energy Systems Southern Africa (RES)	Project Manager & EAP
Wind Garden WEF, Eastern Cape	Wind Garden (Pty) Ltd	Project Manager & EAP
Fronteer WEF, Eastern Cape	Fronteer (Pty) Ltd	Project Manager & EAP
Aeolus WEF, Eastern Cape	Aeolus (Pty) Ltd	Project Manager & EAP
Hamlett WEF, Eastern Cape	Hamlett (Pty) Ltd	Project Manager & EAP
Redding WEF, Eastern Cape	Redding (Pty) Ltd	Project Manager & EAP
Ripponn WEF, Eastern Cape	Ripponn (Pty) Ltd	Project Manager & EAP

#### **Screening Studies**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Albertinia WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Koingnaas WEF, Northern Cape	Just Pal Tree Power	Project Manager & EAP
Napier Region WEF Developments, Western Cape	BioTherm Energy	Project Manager & EAP
Tsitsikamma WEF, Eastern Cape	Exxarro Resources	Project Manager & EAP
Various WEFs within an identified area in the Overberg area, Western Cape	BioTherm Energy	Project Manager & EAP
Various WEFs within an identified area on the West Coast, Western Cape	Investec Bank Limited	Project Manager & EAP
Various WEFs within an identified area on the West Coast, Western Cape	Eskom Holdings Limited	Project Manager & EAP
Various WEFs within the Western Cape	Western Cape Department of Environmental Affairs and Development Planning	Project Manager & EAP
Velddrift WEF, Western Cape	VentuSA Energy	Project Manager & EAP
Wind 1000 Project	Thabo Consulting on behalf of Eskom Holdings	Project Manager & EAP
Wittekleibosch, Snylip & Doriskraal WEFs, Eastern Cape	Exxarro Resources	Project Manager & EAP

#### **Environmental Compliance, Auditing and ECO**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
ECO for the construction of the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager
ECO for the construction of the Gouda WEF, Western Cape	Blue Falcon	Project Manager
EO for the Dassiesklip Wind Energy Facility, Western Cape	Group 5	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation	Blue Falcon	Project Manager

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
activities at the Gouda Wind Energy facility near Gouda, Western Cape		
Annual auditing of compliance with all environmental licenses for the operation activities at the West Coast One Wind Energy facility near Vredenburg, Western Cape	Aurora Wind Power	Project Manager
External environmental and social audit for the Amakhala Wind Farm, Eastern Cape	Cennergi	Project Manager
External environmental and social audit for the Tsitsikamma Wind Farm, Eastern Cape	Cennergi	Project Manager
ECO for the construction of the Excelsior Wind Farm and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
External compliance audit of the Dassiesklip Wind Energy Facility, Western Cape	BioTherm Energy	Project Manager

### Compliance Advice

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Amakhala Phase 1 WEF, Eastern Cape	Cennergi	Environmental Advisor
Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Environmental Advisor
Excelsior Wind Farm, Western Cape	BioTherm Energy	Environmental Advisor
Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Hopefield Community WEF, Western Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Rheboksfontein WEF, Western Cape	Moyeng Energy	Environmental Advisor
Tiqua WEF, Western Cape	Cennergi	Environmental Advisor
Tsitsikamma WEF, Eastern Cape	Cennergi	Environmental Advisor
West Coast One WEF, Western Cape	Moyeng Energy	Environmental Advisor

### Due Diligence Reporting

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Witteberg WEF, Western Cape	EDPR Renewables	Environmental Advisor
IPD Vredenburg WEF within the Saldanha Bay area, Western Cape	IL&FS Energy Development Company	Environmental Advisor

### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Biodiversity Permitting for the Power Line between the Tsitikamma Community WEF & the Diep River Substation, Eastern Cape	Cennergi	Project Manager & EAP
Biodiversity Permitting for the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager & EAP
Environmental Permitting for the Excelsior WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Plant Permits & WULA for the Tsitsikamma Community WEF, Eastern Cape	Cennergi	Project Manager & EAP
S24G and WULA for the Rectification for the commencement of unlawful activities on Ruimsig AH in Honeydew, Gauteng	Hossam Soror	Project Manager & EAP

Project Name & Location	Client Name	Role
S24G Application for the Rheboksfontein WEF, Western Cape	Ormonde - Theo Basson	Project Manager & EAP
S53 Application & WULA for Suurplaat and Gemini WEFs, Northern Cape	Engie	Project Manager & EAP
S53 Application for the Hopefield Community Wind Farm near Hopefield, Western Cape	Umoya Energy	Project Manager & EAP
S53 Application for the Project Blue WEF, Northern Cape	WWK Developments	Project Manager & EAP
S53 for the Oyster Bay WEF, Eastern Cape	RES	Project Manager & EAP
WULA for the Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP

## **CONVENTIONAL POWER GENERATION PROJECTS (COAL)**

### **Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Mutsho Power Station near Makhado, Limpopo	Mutsho Consortium	Project Manager & EAP
Coal-fired Power Station near Ogies, Mpumalanga	Ruukki SA	Project Manager & EAP
Thabametsi IPP Coal-fired Power Station, near Lephallale, Limpopo	Axia	Project Manager & EAP
Transalloys Coal-fired Power Station, Mpumalanga	Transalloys	Project Manager & EAP
Tshivasho IPP Coal-fired Power Station (with WML), near Lephallale, Limpopo	Cennergi	Project Manager & EAP
Umbani Coal-fired Power Station, near Kriel, Mpumalanga	ISS Global Mining	Project Manager & EAP
Waterberg IPP Coal-Fired Power Station near Lephallale, Limpopo	Exxaro Resources	Project Manager & EAP

### **Basic Assessments**

Project Name & Location	Client Name	Role
Coal Stockyard on Medupi Ash Dump Site, Limpopo	Eskom Holdings	Project Manager & EAP
Biomass Co-Firing Demonstration Facility at Arnot Power Station East of Middleburg, Mpumalanga	Eskom Holdings	Project Manager & EAP

### **Screening Studies**

Project Name & Location	Client Name	Role
Baseload Power Station near Lephallale, Limpopo	Cennergi	Project Manager & EAP
Coal-Fired Power Plant near Delmas, Mpumalanga	Exxaro Resources	Project Manager & EAP
Makhado Power Station, Limpopo	Mutsho Consortium, Limpopo	Project Manager & EAP

### **Environmental Compliance, Auditing and ECO**

Project Name & Location	Client Name	Role
ECO for the Camden Power Station, Mpumalanga	Eskom Holdings	Project Manager

### **Compliance Advice**

Project Name & Location	Client Name	Role
Thabametsi IPP Coal-fired Power Station, near Lephallale, Limpopo	Axia	Environmental Advisor

**Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

Project Name & Location	Client Name	Role
Permit application for the Thabametsi Bulk Water Pipeline, near Lephallale, Limpopo	Axia	Project Manager & EAP
S53 & WULA for the Waterberg IPP Coal-Fired Power Station near Lephallale, Limpopo	Exxaro Resources	Project Manager & EAP
S53 Application for the Tshivasho Coal-fired Power Station near Lephallale, Limpopo	Cennergi	Project Manager & EAP

**CONVENTIONAL POWER GENERATION PROJECTS (GAS)****Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Ankerlig OCGT to CCGT Conversion project & 400 kV transmission power line between Ankerlig and the Omega Substation, Western Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Gourikwa OCGT to CCGT Conversion project & 400kV transmission power line between Gourikwa & Proteus Substation, Western Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	Project Manager & EAP
Richards Bay Gas to Power Plant, KwaZulu-Natal	Richards Bay Gas Power 2	Project Manager & EAP
Decommissioning & Recommissioning of 3 Gas Turbine Units at Acacia Power Station & 1 Gas Turbine Unit at Port Rex Power Station to the existing Ankerlig Power Station in Atlantis Industria, Western Cape	Eskom Holdings	Project Manager & EAP
320MW gas-to-power station in Richards Bay, KwaZulu-Natal	Phinda Power Projects	Project Manager & EAP
3000MW Richards Bay Gas to Power Plant, KwaZulu-Natal	Phakwe Richards Bay Gas Power 3	Project Manager & EAP

**Screening Studies**

Project Name & Location	Client Name	Role
Fatal Flaw Analysis for 3 area identified for the establishment of a 500MW CCGT Power Station	Globeleq Advisors Limited	Project Manager & EAP
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	Project Manager & EAP

**GRID INFRASTRUCTURE PROJECTS****Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Aggeneis-Oranjemond Transmission Line & Substation Upgrade, Northern Cape	Eskom Transmission	Project Manager & EAP
Ankerlig-Omega Transmission Power Lines, Western Cape	Eskom Transmission	Project Manager & EAP
Karoshhoek Grid Integration project as part of the Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Koeberg-Omega Transmission Power Lines,, Western Cape	Eskom Transmission	Project Manager & EAP

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Koeberg-Stikland Transmission Power Lines, Western Cape	Eskom Transmission	Project Manager & EAP
Kyalami Strengthening Project, Gauteng	Eskom Transmission	Project Manager & EAP
Mokopane Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP
Saldanha Bay Strengthening Project, Western Cape	Eskom Transmission	Project Manager & EAP
Steelpoort Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP
Transmission Lines from the Koeberg-2 Nuclear Power Station site, Western Cape	Eskom Transmission	Project Manager & EAP
Tshwane Strengthening Project, Phase 1, Gauteng	Eskom Transmission	Project Manager & EAP
Main Transmission Substation (MTS) associated with the Choje Wind Farm cluster, Eastern Cape	Wind Relic	Project Manager & EAP
Main Transmission Substation and grid connection infrastructure associated with the Ummbila renewable energy cluster	Windlab	Project Manager & EAP

### Basic Assessments

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Dassenberg-Koeberg Power Line Deviation from the Koeberg to the Ankerlig Power Station, Western Cape	Eskom Holdings	Project Manager & EAP
Golden Valley II WEF Power Line & Substation near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Golden Valley WEF Power Line near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Karoshhoek Grid Integration project as part of the Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Konkoonsies II PV SEF Power Line to the Paulputs Substation near Pofadder, Northern Cape	BioTherm Energy	Project Manager & EAP
Perdekraal West WEF Powerline to the Eskom Kappa Substation, Western Cape	BioTherm Energy	Project Manager & EAP
Rheboksfontein WEF Powerline to the Aurora Substation, Western Cape	Moyeng Energy	Project Manager & EAP
Soetwater Switching Station near Sutherland, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Solis Power I Power Line & Switchyard Station near Upington, Northern Cape	Brightsource	Project Manager & EAP
Stormwater Canal System for the Ilanga CSP near Upington, Northern Cape	Karoshhoek Solar One	Project Manager & EAP
Tsitsikamma Community WEF Powerline to the Diep River Substation, Eastern Cape	Eskom Holdings	Project Manager & EAP
Two 132kV Chickadee Lines to the new Zonnebloem Switching Station, Mpumalanga	Eskom Holdings	Project Manager & EAP
Electrical Grid Infrastructure for the Kolkies and Sadawa PV clusters, Western Cape	Mainstream Renewable Energy Developments	Project Manager & EAP
Sadawa Collector substation, Western Cape	Mainstream Renewable Energy Developments	Project Manager & EAP
Electrical Grid Infrastructure for the Vrede and Rondavel PV facilities, Free State	Mainstream Renewable Energy Developments	Project Manager & EAP

### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Ferrum-Mookodi Transmission Line, Northern Cape and North West	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section A Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section B Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Hydra IPP Integration project, Northern Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Kappa-Sterrekus Section C Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Namaqualand Strengthening project in Port Nolloth, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
ECO for the construction of the Neptune Substation Soil Erosion Mitigation Project, Eastern Cape	Eskom	Project Manager
ECO for the construction of the Ilanga-Gordonia 132kV power line, Northern Cape	Karoshhoek Solar One	Project Manager

### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Environmental Permitting and WULA for the Rockdale B Substation & Loop in Power Lines,	Eskom Holdings	Project Manager & EAP
Environmental Permitting and WULA for the Steelpoort Integration project, Limpopo	Eskom Holdings	Project Manager & EAP
Environmental Permitting for Solis CSP near Upington, Northern Cape	Brightsource	Project Manager & EAP

### MINING SECTOR PROJECTS

#### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Elitheni Coal Mine near Indwe, Eastern Cape	Elitheni Coal	Project Manager & EAP
Groot Letaba River Development Project Borrow Pits	liso	Project Manager & EAP
Grootegeeluk Coal Mine for coal transportation infrastructure between the mine and Medupi Power Station (EMPr amendment) , Limpopo	Eskom Holdings	Project Manager & EAP
Waterberg Coal Mine (EMPr amendment), Limpopo	Seskoko Resources	Project Manager & EAP
Aluminium Plant WML & AEL, Gauteng	GfE-MIR Alloys & Minerals	Project Manager & EAP

#### Basic Assessments

Project Name & Location	Client Name	Role
Rare Earth Separation Plant in Vredendal, Western Cape	Rareco	Project Manager & EAP
Decommissioning and Demolition of Kilns 5 & 6 at the Slurry Plant, Kwa-Zulu Natal	PPC	Project Manager & EAP

### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Duhva Mine Water Recovery Project, Mpumalanga	Eskom Holdings SoC Limited	Project Manager



<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
External compliance audit of Palesa Coal Mine's Integrated Water Use License (IWUL), near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Palesa Coal Mine's Waste Management License (WML) and EMP, near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Mbali Coal Mine's Integrated Water Use License (IWUL), near Ogies, Mpumalanga	HCI Coal	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mining Operations (Brand se Baai), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mineral Separation Plant (MSP), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Smelter Operations (Saldanha), Western Cape	Tronox Namakwa Sands	Project Manager
Compliance Auditing of the Waste Management Licence for the PetroSA Landfill Site at the GTL Refinery, Western Cape	PetroSA	Project Manager

#### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Waste Licence Application for the Rare Earth Separation Plant in Vredendal, Western Cape	Rareco	Project Manager & EAP
WULA for the Expansion of the Landfill site at Exxaro's Namakwa Sands Mineral Separation Plant, Western Cape	Exxaro Resources	Project Manager & EAP
S24G & WML for an Aluminium Plant, Gauteng	GfE-MIR Alloys & Minerals	Project Manager & EAP

#### **INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

##### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Bridge across the Ngotwane River, on the border of South Africa and Botswana	Eskom Holdings	Project Manager & EAP
Chemical Storage Tanks, Metallurgical Plant Upgrade & Backfill Plant upgrade at South Deep Gold Mine, near Westonaria, Gauteng	Goldfields	Project Manager & EAP
Expansion of the existing Welgedacht Water Care Works, Gauteng	ERWAT	Project Manager & EAP
Golden Valley WEF Access Road near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Great Fish River Wind Farm Access Roads and Watercourse Crossings near Cookhouse, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Ilanga CSP Facility Watercourse Crossings near Upington, Northern Cape	Karoshhoek Solar one	Project Manager & EAP



Project Name & Location	Client Name	Role
Modification of the existing Hartebeestfontein Water Care Works, Gauteng	ERWAT	Project Manager & EAP
N10 Road Realignment for the Ilanga CSP Facility, East of Upington, Northern Cape	SANRAL	Project Manager & EAP
Nxuba (Bedford) Wind Farm Watercourse Crossings near Cookhouse, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Pollution Control Dams at the Medupi Power Station Ash Dump & Coal Stockyard, Limpopo	Eskom	Project Manager & EAP
Clayville Central Steam Plant, Gauteng	Bellmall Energy	Project Manager & EAP

#### Basic Assessments

Project Name & Location	Client Name	Role
Harmony Gold WWTW at Doornkop Mine, Gauteng	Harmony Doornkop Plant	Project Manager & EAP
Ofir-ZX Watercourse Crossing for the Solar PV Facility, near Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Qoboshane bridge & access roads, Eastern Cape	Emalahleni Local Municipality	Project Manager & EAP
Relocation of the Assay Laboratory near Carletonville, Gauteng	Sibanye Gold	Project Manager & EAP
Richards Bay Harbour Staging Area, KwaZulu-Natal	Eskom Holdings	Project Manager & EAP
S-Kol Watercourse Crossing for the Solar PV Facility, East of Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Sonnenberg Watercourse Crossing for the Solar PV Facility, West Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Kruisvallei Hydroelectric Power Generation Scheme, Free State	Building Energy	Project Manager & EAP
Masetjaba Water Reservoir, Pump Station and Bulk Supply Pipeline near Nigel, Gauteng	Naidu Consulting Engineers	Project Manager & EAP
Access Road for the Dwarsug Wind Farm, Northern Cape Province	South Africa Mainsteam Renewable Power	Project Manager & EAP
Qoboshane borrow pits (EMPr only), Eastern Cape	Emalahleni Local Municipality	Project Manager & EAP
Tsitsikamma Community WEF Watercourse Crossings, Eastern Cape	Cennergi	Project Manager & EAP
Msenge Emoyeni Wind Farm Watercourse Crossings and Roads, Eastern Cape	Windlab	Project Manager & EAP
Access road to Wolf WEF, Eastern Cape	Red Rocket	Project Manager & EAP
Access road to Witberg WEF, Western Cape	Red Rocket	Project Manager & EAP

#### Screening Studies

Project Name & Location	Client Name	Role
Roodepoort Open Space Optimisation Programme (OSOP) Precinct, Gauteng	TIMAC Engineering Projects	Project Manager & EAP
Vegetable Oil Plant and Associated Pipeline, Kwa-Zulu Natal	Wilmar Oils and Fats Africa	Project Manager & EAP

#### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Olifants River Water Resources Development Project (ORWRDP) Phase 2A: De Hoop Dam, R555 realignment and housing infrastructure	Department of Water and Sanitation	Project Manager Auditor

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
ECO for the Rehabilitation of the Blaaupan & Storm Water Channel, Gauteng	Airports Company of South Africa (ACSA)	Project Manager
Due Diligence reporting for the Better Fuel Pyrolysis Facility, Gauteng	Better Fuels	Project Manager
ECO for the Construction of the Water Pipeline from Kendal Power Station to Kendal Pump Station, Mpumalanga	Transnet	Project Manager
ECO for the Replacement of Low-Level Bridge, Demolition and Removal of Artificial Pong, and Reinforcement the Banks of the Crocodile River at the Construction at Walter Sisulu National Botanical Gardens, Gauteng Province	South African National Biodiversity Institute (SANBI)	Project Manager
External Compliance Audit of the Air Emission Licence (AEL) for a depot in Bloemfontein, Free State Province and in Tzaneen, Mpumalanga Province	PetroSA	Project Manager

#### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
WULA for the Izubulo Private Nature Reserve, Limpopo	Kjell Bismeyer, Jann Bader, Laurence Saad	Project Manager & EAP
WULA for the Masodini Private Game Lodge, Limpopo	Masodini Private Game Lodge	Environmental Advisor
WULA for the Ezulwini Private Nature Reserve, Limpopo	Ezulwini Investments	Project Manager & EAP
WULA for the Masodini Private Game Lodge, Limpopo	Masodini Private Game Lodge	Project Manager & EAP
WULA for the N10 Realignment at the Ilanga SEF, Northern Cape	Karoshok Solar One	Project Manager & EAP
WULA for the Kruisvallei Hydroelectric Power Generation Scheme, Free State	Building Energy	Project Manager & EAP
S24G and WULA for the illegal construction of structures within a watercourse on EFF 24 Ruimsig Agricultural Holdings, Gauteng	Sorrow Language Services	Project Manager & EAP

#### **HOUSING AND URBAN PROJECTS**

##### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Postmasburg Housing Development, Northern Cape	Transnet	Project Manager & EAP
Expansion of Wildekranz Tourism facilities, Western Cape	Wildekranz Trust	Project Manager & EAP

##### **Compliance Advice and reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Kampi ya Thude at the Olifants West Game Reserve, Limpopo	Nick Elliot	Environmental Advisor
External Compliance Audit of WUL for the Johannesburg Country Club, Gauteng	Johannesburg Country Club	Project Manager

**Environmental Compliance, Auditing and ECO**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Due Diligence Audit for the Due Diligence Audit Report, Gauteng	Delta BEC (on behalf of Johannesburg Development Agency (JDA))	Project Manager

**ENVIRONMENTAL MANAGEMENT TOOLS**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Development of the 3rd Edition Environmental Implementation Plan (EIP)	Gauteng Department of Agriculture and Rural Development (GDARD)	Project Manager & EAP
Development of Provincial Guidelines on 4x4 routes, Western Cape	Western Cape Department of Environmental Affairs and Development Planning	EAP
Compilation of Construction and Operation EMP for the Braamhoek Transmission Integration Project, Kwazulu-Natal	Eskom Holdings	Project Manager & EAP
Compilation of EMP for the Wholesale Trade of Petroleum Products, Gauteng	Munaca Technologies	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for Medupi Power Station, Limpopo	Eskom Holdings	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for the Dube TradePort Site Wide Precinct	Dube TradePort Corporation	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for the Kusile Power Station, Mpumalanga	Eskom Holdings	Project Manager & EAP
Review of Basic Assessment Process for the Wittekleibosch Wind Monitoring Mast, Eastern Cape	Exxaro Resources	Project Manager & EAP
Revision of the EMPr for the Sirius Solar PV	Aurora Power Solutions	Project Manager & EAP
State of the Environment (SoE) for Emalahleni Local Municipality, Mpumalanga	Simo Consulting on behalf of Emalahleni Local Municipality	Project Manager & EAP
Aspects and Impacts Register for Salberg Concrete Products operations	Salberg Concrete Products	EAP
First State of Waste Report for South Africa	Golder on behalf of the Department of Environmental Affairs	Project Manager & EAP
Responsibilities Matrix and Gap Analysis for the Kruisvallei Hydroelectric Power Generation Scheme, Free State Province	Building Energy	Project Manager
Responsibilities Matrix and Gap Analysis for the Roggeveld Wind Farm, Northern & Western Cape Provinces	Building Energy	Project Manager

**PROJECTS OUTSIDE OF SOUTH AFRICA**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Advisory Services for the Zizabona Transmission Project, Zambia, Zimbabwe, Botswana & Namibia	PHD Capital	Advisor
EIA for the Semonkong WEF, Lesotho	MOSCET	Project Manager & EAP

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
EMP for the Kuvaninga Energia Gas Fired Power Project, Mozambique	ADC (Pty) Ltd	Project Manager & EAP
Environmental Screening Report for the SEF near Thabana Morena, Lesotho	Building Energy	EAP
EPBs for the Kawambwa, Mansa, Mwense and Nchelenge SEFs in Luapula Province, Zambia	Building Energy	Project Manager & EAP
ESG Due Diligence for the Hilton Garden Inn Development in Windhoek, Namibia	Vatange Capital	Project Manager
Mandahill Mall Rooftop PV SEF EPB, Lusaka, Zambia	Building Energy	Project Manager & EAP
Monthly ECO for the PV Power Plant for the Mocuba Power Station	Scatec	Project Manager

## CURRICULUM VITAE OF CHANTELE GEYER

- Profession :** Environmental Assessment Practitioner and Lead GIS Consultant
- Specialisation:** Environmental Management; Project-Related GIS Mapping; Water Use Licenses; Public Participation; General Geology and Geochemistry.
- Work Experience:** One year in the environmental field.

### VOCATIONAL EXPERIENCE

Chantelle is a conscientious and ambitious Environmental Consultant who holds a BSc (Hons) degree in Environmental Geology. She recently graduated from the North-West University where she consistently stayed in the top 3 of her class. She joined a group of passionate academic peers in her third year to create the first North-West University Geoscience Society to teach young earth scientists about the environment and introduce them to professional mentors, thus bridging the gap between university and a professional career. She was appointed as project manager for this society for two consecutive terms and organized career talks, academic game shows, alumni talks, clean-up initiatives, and numerous team-building events.

She has special interests in geological formations, geochemistry, minerals, contamination studies, rehabilitation and restoration of disturbed areas, as well as hydrology. However, she found her passion for Environmental Management during an environmental internship where she gained experience in:

- Environmental Impact Assessments
- Project-related GIS mapping
- Water use licences
- Public participation processes

Chantelle is a loyal and enthusiastic individual who is dedicated to further her studies in Environmental Management, Environmental Legislation, GIS-mapping, and studies on the renewable energy sector of South Africa. Her goal is to gain knowledge in the processes of Basic Assessments, Environmental Impact Assessments, Environmental Compliance, EA amendments, environmental permitting, public participation, screening assessments, and environmental authorisation applications. She aims to use this knowledge to strategically consult clients and undertaking projects efficiently and to the highest standard.

### SKILLS BASE AND CORE COMPETENCIES

- Specialized in environmental permitting
- Great organisational skills
- Good at time management
- Passionate about the environment
- Compilation of Environmental Reports in compliance with environmental legislation.
- Project management for environmental-related events and projects.
- Water Use Licences
- Aiding with public participation processes.
- Experience with South African environmental legislation.

- ArcMap.

## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- BSc Environmental Sciences, North-West University, Potchefstroom (2021)
- BSc Honours Environmental Geology, North-West University, Potchefstroom (2022)

### Short Courses:

- Advanced Microsoft Excel Qualification, Lead Academy (2020)

### Professional Society Affiliations:

- Candidate EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA)(2022/5021)
- Registered with the International Association for Impact Assessment South Africa (IAIAsa)
- Golden Key International Honour Society

## EMPLOYMENT

Date	Company	Roles and Responsibilities
<b>July 2023 – Present:</b>	Savannah Environmental (Pty) Ltd	<i>Environmental Assessment Practitioner and Lead GIS Consultant</i> <u>Tasks include:</u> <i>Environmental Assessment Practitioner (EAP); Leading project-related GIS mapping. Performing Basic Assessment Reports and Environmental Impact Assessments, Environmental Permitting, and Public Participation Processes.</i>
<b>July 2022 – July 2023:</b>	Savannah Environmental (Pty) Ltd	<i>Junior Environmental Consultant</i> <u>Tasks include:</u> <i>Environmental Assessment Practitioner (EAP); Specialising in project-related GIS mapping. Performing Basic Assessment Reports and Environmental Impact Assessments, Assisting with public participation processes.</i>
<b>February 2020 – November 2022</b>	North-West University Geoscience Society	<i>Project Manager</i> <u>Tasks include:</u> <i>Organize and facilitate all the committee events Plan and allocate project resources Creating a budget Track projects progress and inform the rest of the society members regarding the running projects Translation of important documents and posters Graphic Design Social Media management and marketing</i>
<b>September 2021 – November 2021</b>	Prescali Environmental (Pty)	<i>Environmental Intern</i> <u>Tasks included:</u>

Date	Company	Roles and Responsibilities
		Liaising with senior management on environmental concerns, Preparing Water Use Licence (WUL) audits, Taking minutes during meetings, Public Participation tasks.

## PROJECT EXPERIENCE

Project experience includes renewable energy projects, grid connection infrastructure, and other infrastructure.

### RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES

#### **Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Mutsho Solar PV (4x100MW projects), Limpopo	Cri-Eagle	Junior EAP & GIS Specialist
Harmony One Plant Solar PV Facility (30MW), Free State	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Harmony Target Solar PV Facility (30MW), Free State	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Harmony Joel Solar PV Facility (18MW), Free State	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Umbhila Emoyeni SEF (150MW), Mpumalanga	Windlab Developments South Africa (Pty) Ltd	Junior EAP & GIS Specialist
Phadima Solar PV Facility (240MW), Gauteng Province	WKN Windcurrent	EAP & GIS Specialist
Rivierplaats Energy Park (200MW), Free State	Pele Energy	EAP & GIS Specialist

#### **Basic Assessments**

Project Name & Location	Client Name	Role
Harmony Central Plant Solar PV Facility (14MW), Free State	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Harmony Moab Khotsong Solar PV Facility (100MW), Free State	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Highveld Solar PV Facility (240MW), North West	WKN Windcurrent	Junior EAP & GIS Specialist
Riet Solar PV Cluster (400MW), Mpumalanga	African Clean Energy Developments (ACED)	Junior EAP & GIS Specialist
Harmony Kalgold Solar PV Facility (15MW), North West	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Harmony Chemwes Solar PV Facility (15MW), North West	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Quantum 1 Solar PV Facility (10MW), Gauteng	South African Mainstream Renewable Power	EAP & GIS Specialist
Matla Solar PV Facility (35MW), Mpumalanga	Cennergi Holdings	EAP & GIS Specialist

#### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

Project Name & Location	Client Name	Role
San Solar PV Part 1 Amendment	Acciona	Junior EAP & GIS Specialist
San Solar PV WULA	Acciona	Junior EAP & GIS Specialist
Red Sands PV3 Part 1 Amendment	AGV Projects	Junior EAP & GIS Specialist

Harmony Central Plant Solar PV Facility GA	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Harmony Moab Khotsong Solar PV Facility GA	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Mutsho Solar PV (4x100MW projects) GAs	Cri-Eagle	EAP & GIS Specialist
Harmony One Plant Solar PV Facility GA	ENGP/Harmony Gold	Junior EAP & GIS Specialist
Highveld Solar PV Facility GA	WKN Windcurrent	EAP & GIS Specialist
Highveld Solar PV Facility S53	WKN Windcurrent	EAP & GIS Specialist
Umbhila SEF Biodiversity Permitting	Seriti Green	EAP & GIS Specialist

## **RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Umbhila Emoyeni WEF (666MW), Mpumalanga	Windlab Developments South Africa (Pty) Ltd	Junior EAP & GIS Specialist

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Kudu Wind Farm (625MW), Eastern Cape	EnergyTeam	Junior EAP & GIS Specialist
Tango Wind Farm (240MW), Eastern Cape	EnergyTeam	Junior EAP & GIS Specialist

### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Umbhila WEF Biodiversity Permitting	Seriti Green	EAP & GIS Specialist

## **RENEWABLE POWER GENERATION PROJECTS: OTHER TECHNOLOGY**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Renewable Anzani Power Plant (65MW), Mpumalanga	HDF Energy	GIS Specialist
Renewable Kopano Power Plant (65MW), Mpumalanga	HDF Energy	GIS Specialist

## **GRID INFRASTRUCTURE PROJECTS**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Umbhila Emoyeni EGI, Mpumalanga	Windlab Developments South Africa (Pty) Ltd	Junior EAP & GIS Specialist

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Mutsho Solar Grid Connection, Limpopo	Cri-Eagle	Junior EAP & GIS Specialist
Highveld Grid Connection, North West	WKN Windcurrent	Junior EAP & GIS Specialist



**INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

**Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>Witberg WEF Access Road, Western Cape</i>	<i>Red Rocket South Africa (Pty) Ltd</i>	<i>Junior EAP and GIS Specialist</i>
<i>Impofu Buffer Yard, Eastern Cape</i>	<i>Enel Green Power South Africa</i>	<i>GIS Specialist</i>

## CURRICULUM VITAE OF CORNELIUS A. HOLTZHAUSEN

Comprehensive CV

**Profession:** Public Participation and Social Impact Consultant

**Specialisation:** Public Participation and Social Impact Assessment

**Work Experience:** Ten (10) Months in Social Impact Assessment

### VOCATIONAL EXPERIENCE

Cornelius Holtzhausen is registered with the International Association for Public Participation (IAP2SA145), South Africa and holds an MSocSci in Cultural Anthropology as well as a postgraduate degree in Social Impact Assessment and Public Participation. He has produced a growing list of social impact reports for a wide range of projects. He is responsible for the public participation aspect of the study.

## SKILLS BASE AND CORE COMPETENCIES

- Report and Technical Writing
- Editing
- Analysis and Evaluation
- Communication
- Team Leadership & Development
- Client Relations

## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- Post Graduate Degree in Social Impact Assessment and Public Participation, University of Johannesburg
- Master of Social Sciences in Cultural Anthropology, University of Pretoria
- Bachelor of Social Sciences Honours in Cultural Anthropology University of Pretoria
- BA General Degree, University of Pretoria

### Professional Society Affiliations:

- International Association of Public Participation South Africa ()

## EMPLOYMENT

Date	Company	Roles and Responsibilities
April 2023 - Current:	Savannah Environmental (Pty) Ltd	<u>Tasks include:</u> Social Impact Assessments Public Participation
June 2022 – March 2022	Afzelia Environmental (Pty) Ltd	Xxx <u>Tasks included:</u> Freelance Consulting, Social Impact Assessments

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## PROJECT EXPERIENCE

Project experience includes the Social Impact assessments for access roads, water conveyance systems, dam wall repairs and other water-related projects.

### **INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

#### ***Due Diligence Reporting***

Project Name & Location	Client Name	Role
Kosi Bay Bridge	Kwa-Zulu Natal Department of Transport	Desktop Social Impact Assessment and Stakeholder Engagement
Proposed Upgrade to Road D1867	Kwa-Zulu Natal Department of Transport	Desktop Social Impact Assessment

**Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>Ludeke Dam repairs Project</i>	<i>Umgeni Water</i>	<i>Desktop Social Impact Assessment</i>
<i>The Proposed Nagle-Durban Heights and Inanda-Wiggins conveyance System Refurbishment Project</i>	<i>Umgeni Water</i>	<i>Desktop Social Impact Assessment</i>

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## CURRICULUM VITAE OF MICHAEL MORREIRA

### Comprehensive CV

<b>Profession :</b>	ESG and Sustainability Consultant
<b>Specialisation:</b>	ESG, Sustainability, and Environmental consulting, advisory and management services.
<b>Work Experience:</b>	Savannah Environmental - June 2021 to present - providing environmental consulting, advisory and management services. 7 years of experience managing steel trading and engineering businesses. 11 years of hands-on experience in natural areas management, nature conservation management, and local and international eco-tourism management.

### VOCATIONAL EXPERIENCE

Michael Morreira is presently employed as an ESG and Sustainability consultant at Savannah Environmental, Michael also conducts environmental assessment, consulting, report writing and permitting work at Savannah. Michael has several years of practical business management experience; he also has several years of experience fulfilling various positions on large game reserves in Kwa-Zulu Natal, the Eastern Cape, and Mpumalanga.

Over the years Michael has filled senior management roles and has developed a thorough understanding of good business practice. He has developed unique experience having managed trading and engineering businesses, providing materials to a number of clients involved in large scale engineering and fabrication projects, and large scale industrial maintenance and development projects. He has worked as a game ranger and has managed some of South Africa's most famous private game reserves. Michael is has advanced Field Guide and Lead Trails Guide qualifications with more than 7 years of logged professional guiding experience in Big 5 areas.

Michael's work experience is complemented by his educational qualifications. He has completed an Internationally recognised MBA with a Specialisation in Sustainable Development and International Business. Michael's MBA Thesis revolved around the business benefits, barriers, and level of adoption of Sustainability Imperatives into South African small and medium sized enterprises – he awarded a distinction pass for his Thesis and was consequently awarded his MBA in September, 2020.

Over the years Michael has worked and studied with the ambition of making a positive impact – Michael has completed Environmental SDG Indicators training. Since 2020 he has conducted Impact Analysis and research concerning large businesses impacts relative to the United Nations Sustainable Development Goals.

## SKILLS BASE AND CORE COMPETENCIES

- Research and Analysis
- Nature Conservation Management
- Business Management
- Advanced Nature Guiding
- Measuring environmental SDG indicators
- Environmental and Social Impact Assessments
- Report Writing
- ESG and Sustainability Due Diligence and Assurance Assessments
- Environmental Permitting
- Project Environmental Management System (EMS) development aligned with ISO14001:2015 standards

## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- MBA with a specialisation in International Business and Sustainability (83%). Maastricht School of Management, 2020.
- B-Tech Game Ranch Management. Nelson Mandela Metropolitan University, 2009.
- National Diploma Game Ranch Management (Cum Laude, Best initial degree in the NMMU Faculty of Science). Nelson Mandela Metropolitan University, 2006.

### Short Courses:

- United Nations SDG Indicators Training – 2021 - present
- IAIA Professional Development Program Fundamentals of Impact Assessment, 2021.
- CPD Certified Climate Disclosure Training Program. CDSP Introduction to climate-related disclosures, 2021.
- IFC World Bank Group Sustainability Training and E-Learning Program (STEP), 2021.
- MBA Essentials 15 week short course (90%), University of Stellenbosch Business School, 2018.
- Environmental Impact Assessment Certificate, WESSA, 2012.
- Level 2 Nature Site Guide – Dangerous Animal Areas, THETA, 2009.
- Lead Trails Guide – Dangerous Animal Areas, THETA, 2009.
- Advance 4x4 Off-road Driving Certificate, Land Rover Off-road Driving Academy, 2009.
- Conservation Certificate, East Cape Game Management Association, 2005.
- Spring Valley School of Professional Hunting – Professional Hunters Certificate, 2004

**EMPLOYMENT**

Date	Company	Roles and Responsibilities
<b>June 2021 - current:</b>	Savannah Environmental (Pty) Ltd	<i>ESG and Sustainability Consultant developing ESG and Sustainability reports. Integrated environmental consulting, advisory, permitting and management services as offered by Savannah Environmental.</i>
<b>July 2015 – Feb 2020</b>	MS Steel and Pipe Suppliers t/a Steelscope	<i>Between July 2015 and Feb 2019 Michael served as the branch general manager at MS Steel &amp; Pipe Suppliers t/a Steelscope in Germiston, Gauteng, and between Feb 2019 and Feb 2020 he served as the sales manager. His duties included business general management, growth and development, administration, marketing, sales, customer relationship management, stock controls, debtors controls, overheads management, systems and procedures management, risk management, financial awareness, and staff management</i>
<b>March 2013 – July 2015</b>	BSi Steel Ltd	<i>Between March 2013 and March 2014 Michael served as the assistant branch manager at BSi Steel Kya Sands, Gauteng. His duties included the management and supervision of large scale steel fabrication and production projects, warehouse management, stock controls, key account management, sales, new business development and customer relationship management. Between March 2014 and July 2015 following the closure of the Kya Sands branch his role changed to that of a sales executive and trader at the Westrand branch and at the BSi head office in Klipriver Gauteng – his duties included the management and supervision of large scale steel fabrication and production projects, key account management, sales, new business development and customer relationship management.</i>
<b>February 2008 – September 2012</b>	Mala Mala Private Game Reserve	<i>Between 2008 and 2010 Michael was employed as a ranger at Mala Mala Game Reserve – his duties involved full time hospitality management, nature conservation duties and advanced nature guiding to international clients. Between 2010 and 2012, he was employed as the Rattray's Camp general manager. His duties included the general management, administration, marketing, stock controls and maintenance of all of the camps facilities. During this time he also served as a field guide, host and liaison to high-end international</i>

Date	Company	Roles and Responsibilities
		<p>guests. During this time, Michael fulfilled various nature conservation duties including: large scale burning regimes, wildlife monitoring and care, ecosystem monitoring and rehabilitation projects, road network and camp maintenance duties. He also worked closely with neighbouring reserves and communities to uphold and encourage high quality relationships.</p>
<p><b>January 2006 – January 2008</b></p>	<p>Kragga Kamma Game Reserve</p>	<p>Michael served as the Park Manager at Kragga Kamma Game Park in Port Elizabeth. His duties included the management of construction &amp; maintenance projects for the parks camps, fences, roads, dams and buildings. He was also responsible for wildlife monitoring, wildlife capture, care and translocation (including chemical game capture operations, this included large predators), habitat restoration projects, alien vegetation removal, guiding tourists and hosting functions.</p>
<p><b>January 2005 – January 2006</b></p>	<p>Nambiti Conservancy</p>	<p>Michael served as an assistant manager and game ranger at the Nambiti Conservancy in Ladysmith, KwaZulu Natal. His duties included the introduction and hosting of potential new investors to the game reserve, the oversight of lodge building contractors, the construction and maintenance of road networks, dams and fence lines, the tracking, monitoring and researching of wildlife, the reintroduction and captive care of wildlife including endangered species, the carrying out of vegetation condition and carrying capacity assessments, the removal of exotic vegetation, the development of habitat restoration projects, the management of large scale burning regimes, the guiding and hosting of local and international tourists. He also worked closely with neighbouring communities to uphold and encourage high quality relationships.</p>
<p><b>December 1999 – January 2005</b></p>	<p>Various</p>	<p>Michael's early career saw him fulfil various practical entry level positions – trainee automotive mechanic; fence and wall construction; warehousing and dispatch clerk; steel and fencing materials trading. Mountain operations – Sunday River Ski Resort, United States of America. Part time work including anti-poaching, game management, farm management, and outdoor entertainment management at the PPC Grassridge Cattle and Game Ranch, and the Drakensberg Gardens Golf and Leisure Resort.</p>



## PROJECT EXPERIENCE

Michael has environmental permitting, EIA and report writing experience, he has also written chapters for ESG and Sustainability reports, and assisted with Due Diligence processes. A record of his project experience is below.

### RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES

#### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
EMPr for Claire 1 and 2, Gauteng	Bellmall Energy	Junior EAP / Principal Author
EIA Process for the Middelvlei Solar, 120MW Solar PV Project, Gauteng Province	Sigma Solar	Junior EAP / Principal Author
EIA for 700MW (7x 100MW) Mutsho Solar PV, near Musina, Limpopo	CRI-Eagle	Assist with Public Participation – site notices and process notices

#### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
BAR for Quantum 1 Solar Energy Facility	Mainstream Renewable Energy Projects	Junior EAP / Principal Author
BARs for Letsoai PV cluster, NC Province	BioTherm Energy	Junior EAP / Principal Author

#### **Compliance Advice and ESAP reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
ESAP for Claire 1 and 2	Bellmall Energy	Junior EAP / Principal Author
ESMS BTE / Mulilo BTE Prieska PV, Northern Cape	BioTherm Energy	Junior EAP / Principal Author

#### **Due Diligence Reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Environmental and Social Due Diligence for the Anglo Solar project, Mogalakwena Solar Project	PGE EDF Consortium	Junior EAP / Principal Author

#### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Sendawo Solar Part 1 Amendment – North West Province	BioTherm	Junior EAP / Principal Author
Adams Solar EMPr Amendment – Northern Cape Province	Sola	Junior EAP / Principal Author
Solaris Fields Sun Garden Section 53 – Eastern Cape	Wind Relic	Junior EAP / Principal Author
GPEMF Registration for Claire 03 PV Facility in Clayville, Gauteng	Bellmall Energy	Junior EAP / Principal Author
EA Amendment for Alldays PV Facility - Capacity Increase	BioTherm Energy	Junior EAP / Principal Author

EA amendment for Sendawo PV1, PV2 and PV3 PV facilities – capacity increase	BioTherm Energy	Junior EAP /Principal Author
Loeriesfontein PV & power line EA amendments EA extensions beyond 10 years	BioTherm Energy	Junior EAP /Principal Author
Aries II Part 1 amendment EA extension beyond 10 years	BioTherm Energy	Junior EAP /Principal Author
Kenhardt sunrise power line and Facility Part 1 amendments EA extensions beyond 10 years	BioTherm Energy	Junior EAP /Principal Author
KT PV2 Part 1 amendment - validity extension	Kotulo Tsatsi Energy	Junior EAP /Principal Author
Machadadorp PV Facility Part 1 amendment EA extension beyond 10 years	Solar to Benefit Africa	Junior EAP /Principal Author
Kronos PV1, PV2 and PV3 - amendment of environmental authorisations (x3): validity extension	Juwi Renewable Energies (Pty) Ltd	Junior EAP /Principal Author

### **RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES**

#### ***Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications***

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Wind Garden and Fronteer Section 53 Application – Eastern Cape	Wind Relic	Junior EAP / Principal Author
Redding and Aeolus Section 53 Application – Eastern Cape	Wind Relic	Junior EAP / Principal Author
Hamlett and Rippon Section 53 Application – Eastern Cape	Wind Relic	Junior EAP / Principal Author
Klawer Wind Farm Part 1 EA Amendment – Western Cape	Red Rocket Energy	Junior EAP / Principal Author
Roggeveld Part 1 Amendment – Northern Cape	Roggeveld Wind Energy	Junior EAP / Principal Author
Section 53 applications for Mercury Cluster	Mulilo Renewable Developments	Junior EAP / Principal Author
Perdekraal West Kappa Line - Part 1 Amendment (Validity Extension beyond 10 years including specialist studies and motivation report)	BioTherm Energy	Junior EAP / Principal Author
HARTEBEEST WEF - AMENDMENT OF ENVIRONMENTAL AUTHORISATION: VALIDITY EXTENSION	Junior EAP /Principal Author	Junior EAP / Principal Author

### **CONVENTIONAL POWER GENERATION PROJECTS (COAL)**

#### ***Due Diligence Reporting***

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Richards Bay Coal Terminal ESG Due Diligence Assessment	RBCT	Junior EAP, Researcher, Project Assistant, Author of report chapters

### **GRID INFRASTRUCTURE PROJECTS**

#### ***Environmental Compliance, Auditing and ECO***

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Review of the Pongola & Elandskop EMS system	Eskom, Hyosung	Junior EAP/ EAP/ Principal Author

**Compliance Advice and ESAP reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Hex BESS EMS development and EMPr review	Eskom, Hyosung	Junior EAP/ EAP/ Principal Author

**Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Roggeveld power line Part 1 amendment: change of holder	Roggeveld Wind Power	Junior EAP / Principal Author

**INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)****Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Basic Assessment for the expansion of Highveld Waste Recovery Facility, Mpumalanga	Anglo African Metals (Pty) Ltd	Assist with Public Participation site notices and process notices.
Hopefield Watercourse Crossing	Umoya Energy	Junior EAP, Project Manager, Principle Author

**Compliance Advice and ESAP reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Environmental Management Services for the Lesotho Highlands Development Project (up-front Method Statements & EMPr update)	CGGL (on behalf of LHDA)	Junior EAP assist with Review of EMPr