
BARLERIA PV FACILITY AND ASSOCIATED INFRASTRUCTURE, NORTH WEST PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

March 2022

Prepared for

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within

restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

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

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

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

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

ABBREVIATIONS

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

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

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CHAPTER 1: INTRODUCTION

This Environmental Management Programme (EMPr) has been compiled for the Barleria PV facility and associated infrastructure proposed by Barleria PV (Pty) Ltd (the developer). The project is to be developed on Portion 1, Portion 2 and Portion 3 of the Farm Houthaalboomen 31, located approximately 5km north-west of the town Lichtenburg in the North West Province. The project site falls in Ward 16 of the Ditsobotla Local Municipality and within the greater Ngaka Modiri Molema District Municipality. The project will be designed to have a contracted capacity of up to 75MW, and will make use of either fixed-tilt, single-axis tracking, or dual-axis (double-axis) tracking photovoltaic (PV) solar technology for the generation of electricity.

This EMPr has been developed on the basis of the findings of the Environmental Impact Assessment (EIA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. In terms of the Duty of Care provision in S28(1) of NEMA, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, halted or minimised. The document must therefore be adhered to and updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations, 2014 (as amended) and forms part of the EIA Report for the project.

CHAPTER 2: PROJECT DETAILS

The Applicant, Barleria PV (Pty) Ltd, is proposing the construction of a photovoltaic (PV) solar energy facility (known as the Barleria PV) located on a site located approximately 5km north-west of the town Lichtenburg in the North West Province. The development area falls within the jurisdiction of the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality.

Grid connection infrastructure for the Barleria PV facility will be located outside the PV development area however, within the project site within a 100m corridor. Two grid connections have been assessed as part of the EIA process.

2.1 Project Site

Table 2.1 provides information regarding the proposed project site identified for Barleria PV

Table 2.1 A description of the project site identified for PV1

Province	North West Province		
District Municipality	Ngaka Modiri Molema District Municipality		
Local Municipality	Ditsobotla Local Municipality		
Ward Number(s)	16		
Nearest Town(s)	Lichtenburg (~5km north-west)		
Farm Portion(s), Name(s) and Number(s) associated with the Facility	Portion 1 of the Farm Houthaalboomen 31 Portion 9 of the Farm Houthaalboomen 31 Portion 10 of the Farm Houthaalboomen 31		
Farm Portion(s), Name(s) and Number(s) of properties affected by the Solar PV LILO grid connection	Portion 1 of the Farm Houthaalboomen 31 Portion 0 of Farm Talene 25 Portion 7 of Farm Elandsfontein 34		
SG 21 Digit Code (s)	Portion 1 of the Farm Houthaalboomen 31	TOIP00000000003100001	
	Portion 9 of the Farm Houthaalboomen 31	TOIP00000000003100009	
	Portion 10 of the Farm Houthaalboomen 31	TOIP00000000003100010	
	Portion 0 of Farm Talene 25	TOIP00000000002500000	
	Portion 7 of Farm Elandsfontein 34	TOIP00000000003400007	
Current Zoning	Agriculture		
Current land use	Grazing (mainly livestock)		
Site Extent (project site)	~552ha		
PV Development area	~176		
Site Co-ordinates (project site)		Latitude:	Longitude:
	Northern point	26° 5'58.28"S	26° 5'6.50"E
	Eastern point	26° 6'27.74"S	26° 5'28.32"E
	Southern point	26° 6'56.48"S	26° 5'19.36"E

	Western point	26° 6'36.63"S	26° 4'56.50"E
	Centre point	26° 6'25.20"S;	26° 5'10.14"E

A locality map illustrating the location of Barleria PV is provided in **Figure 2.1**

2.2 Project Description

The infrastructure associated with this PV development includes:

- » PV modules and mounting structures
- » Inverters and transformers
- » Battery Energy Storage System (BESS)
- » Site and internal access roads (up to 8m wide)
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage
- » Temporary and permanent laydown area

» Grid connection solution within a 100m wide corridor, including:

33kV cabling between the project components and the facility substation

A 132kV facility substation

A 132kV Eskom switching station

- o A Loop-in-Loop out (LILO) overhead 132kV power line between the Eskom switching station and the existing Delareyville Munic–Watershed 1 88kV power line.

Grid connection infrastructure for the Barleria PV facility will be located outside the PV development area however, within the project site within a 100m corridor. Two grid connections have been assessed and include:

Grid Connection Alternative 1: 33kV cabling will connect the Barleria PV facility solar array to the 132kV facility substation. The facility substation and Eskom switching station are located directly adjacent to each other approximately 2.2km east of the eastern boundary of the Barleria PV facility development area, on Portion 1 of the Farm Houthaalboomen 31. A 132kV loop-in-loop out power line from the Eskom switching station will connect into the Delareyville Munic–Watershed 1 88kV. The grid connection infrastructure is located within an assessment corridor 100m in width.

Grid Connection Alternative 2: 33kV MV cabling will connect the Barleria PV facility solar array to the 132kV facility substation. The facility substation and Eskom switching station are located directly adjacent to each other approximately 991m east of eastern boundary of the Barleria PV facility development area, on Portion 1 of the Farm Houthaalboomen 31. A 132kV loop-in-loop out power line from the Eskom switching station will connect into the Delareyville Munic–Watershed 1 88kV. The grid connection infrastructure is located within an assessment corridor of 100m wide in width.

A layout map of the Barleria PV including the grid connection alternatives is provided in Figure 2.2.

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

Table 2.3: Planned infrastructure proposed as part of Barleria PV

Infrastructure	Dimensions/ Details
Solar Facility	» 75MW photovoltaic (PV) technology utilising solar panels.
Supporting Infrastructure	» Battery Energy Storage System (BESS)

	<ul style="list-style-type: none"> » Operations and Maintenance buildings » Gate house » Security building » Control centre » Office buildings » Warehouse » Workshop » Visitor's centre
<p>Access road</p>	<ul style="list-style-type: none"> » Access point to the project development area will be via the R505 regional road and main access to the site will be via an existing gravel District Road (D2435) of approximately 2.5km in length, which will need to be upgraded to be up to 8m wide to cater for the construction vehicles navigating the road to the laydown areas on site. » A network of gravel internal access roads, each with a width of up to 5m will be constructed to provide access to the various components of the Barleria PV facility development.
<p>Services required</p>	<ul style="list-style-type: none"> » Refuse material disposal - all generated refuse material will be collected by a private contractor and will be disposed of at a licensed waste disposal site off site. This service will be arranged with the municipality when required. » Sanitation –. All sewage/effluent water will be managed utilising temporary portable chemical toilets. Any other effluent discharge during construction will be stored in sealed containers/tanks and collected (honey-sucker) and treated by a service provider (the LM/ Contractor) at an approved facility off site. These facilities will be maintained and serviced regularly by an appropriate waste contractor. » Water supply – construction water will be sourced from the Ditsobotla Local Municipality (by truck or via pipeline) or from groundwater abstraction. » Electricity supply – approximately 15MW of power may be required during the construction phase. It is proposed that this power be sourced from the existing power lines and/or diesel generators. The necessary applications for the connection to the grid will be submitted to Eskom for approval. » The man camp will require the necessary services such as potable water, electricity and a package plant for waste.

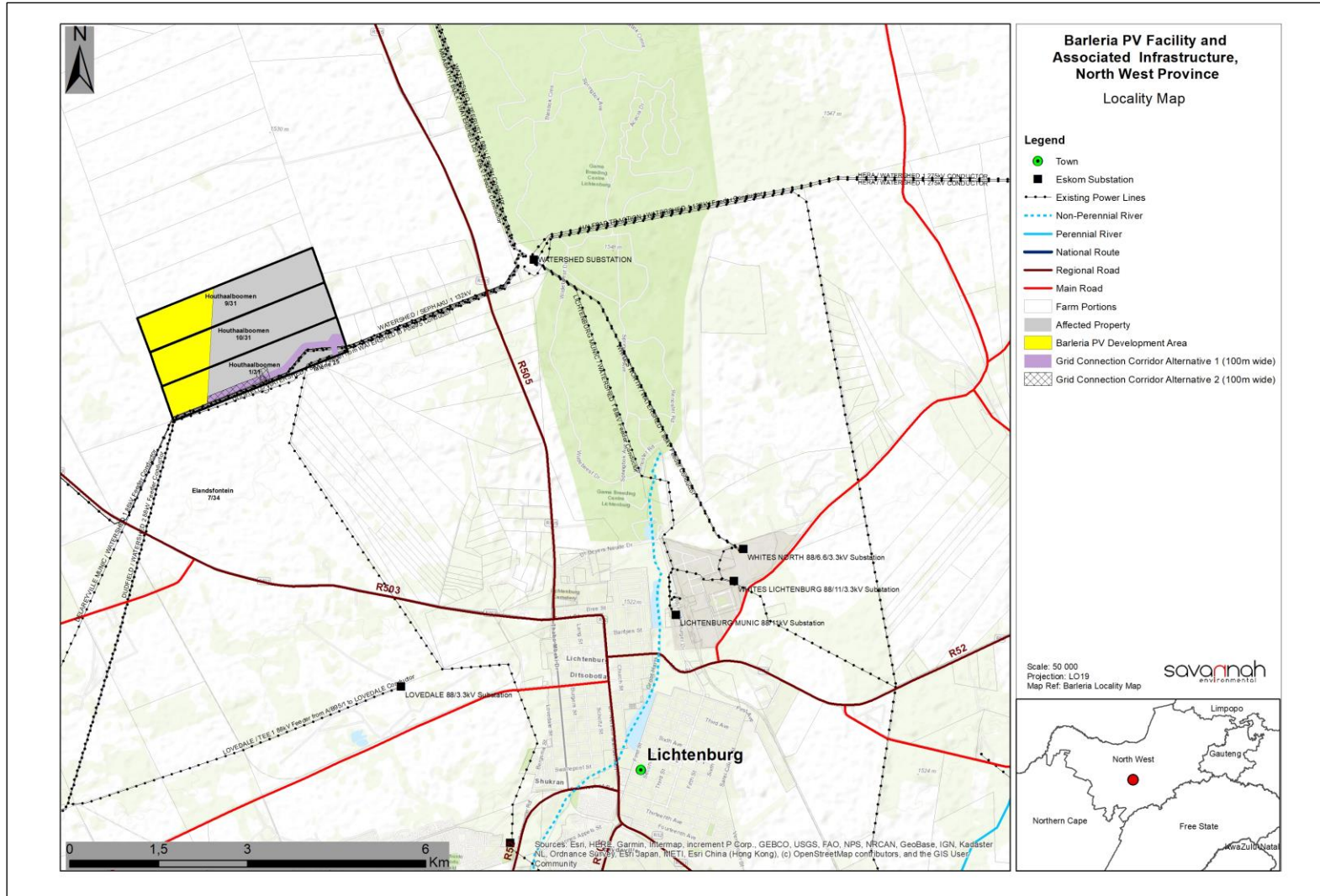


Figure 2.1: Locality map illustrating the location of the Barleria PV development area within the larger project site, including the grid connection corridor alternatives (refer to **Appendix D** for A3 map).

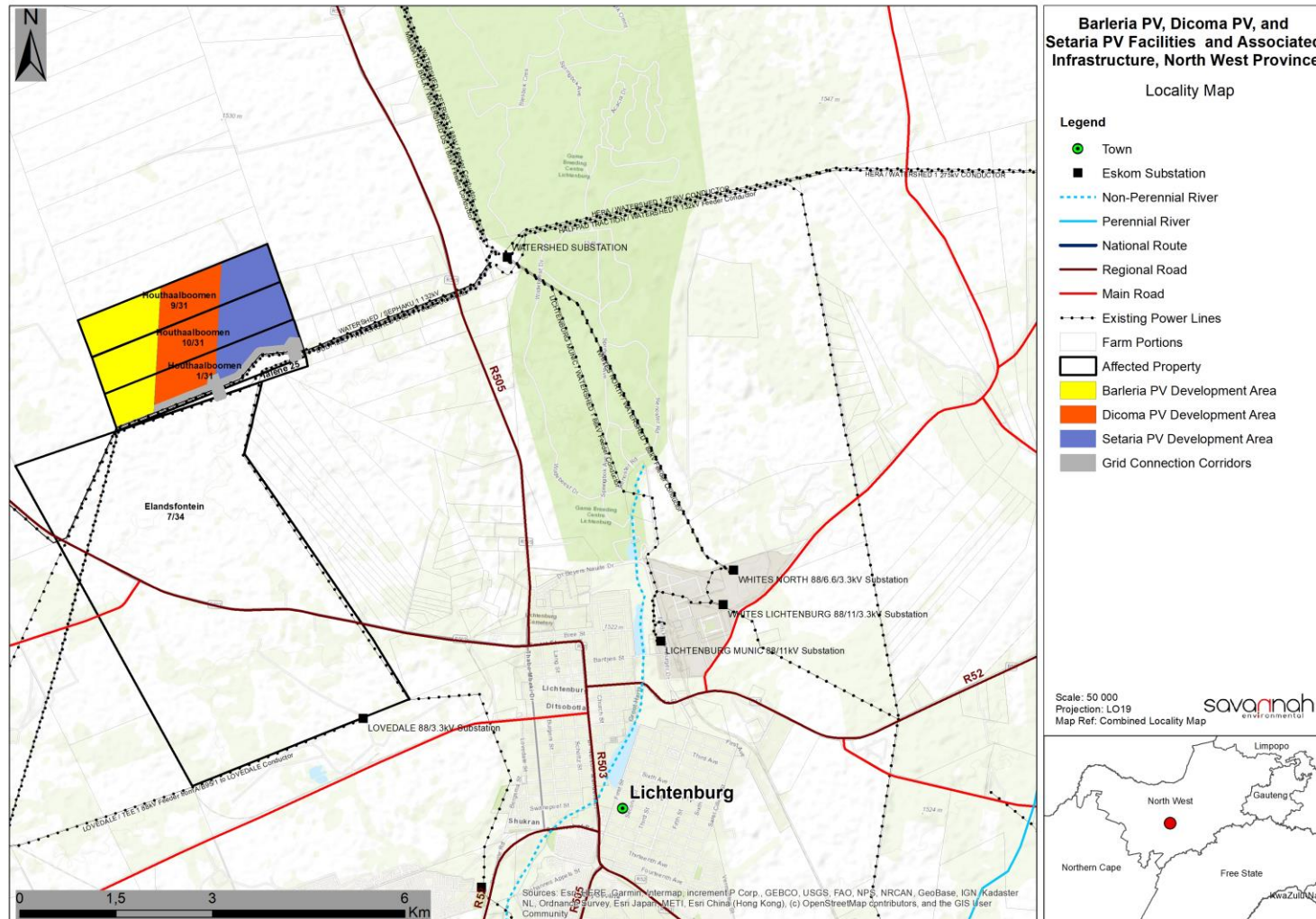


Figure 2.2: Locality map illustrating the locations of the Barleria PV, Dicoma PV and Setaria PV development areas within the project site (refer to **Appendix D** for A3 map)

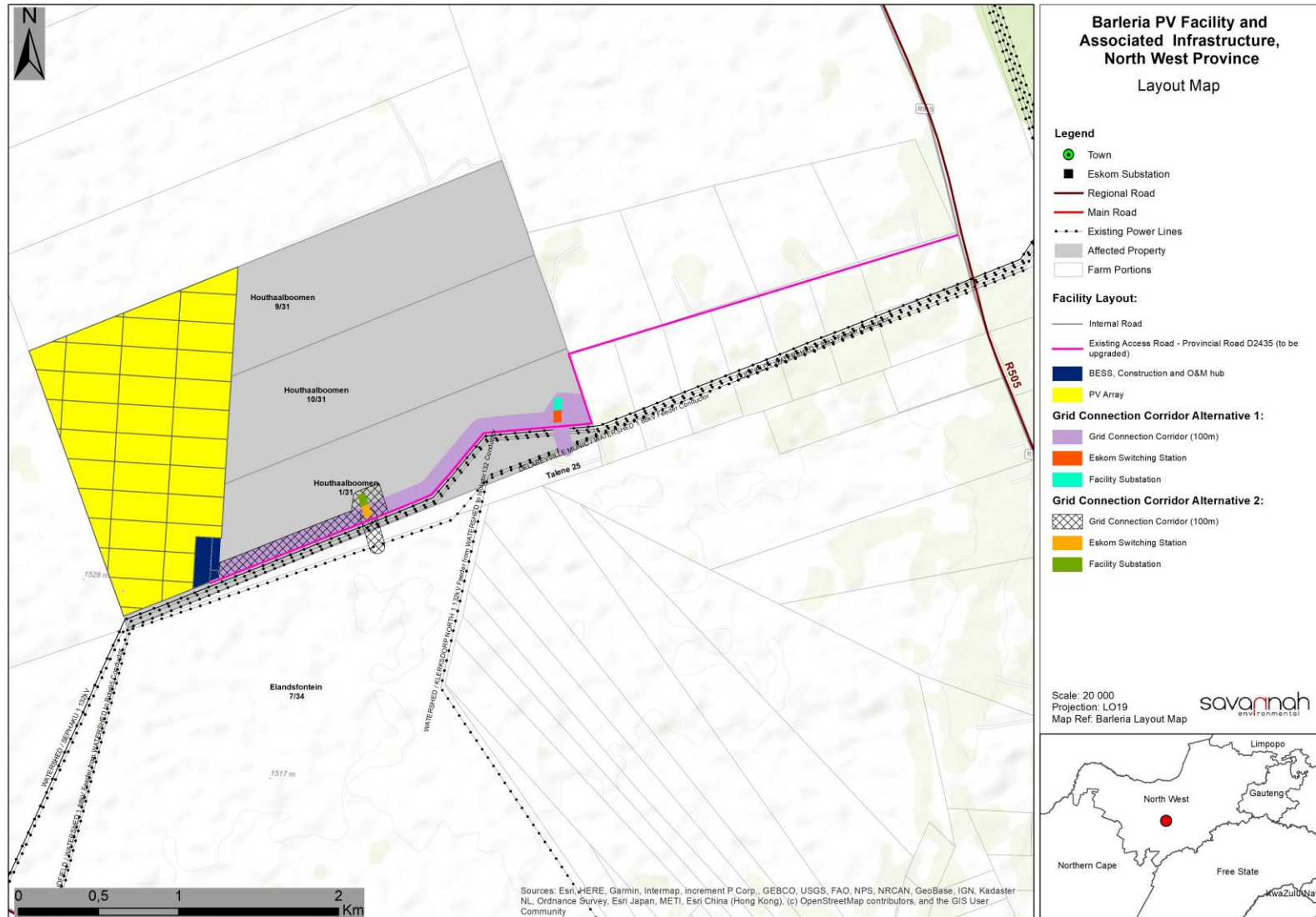


Figure 2.3: Layout Map of the proposed infrastructure for Barleria PV

2.3. Life-cycle Phases of Barleria PV Facility

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

2.3.1. Design and Pre-Construction Phase

Planning

Several post-authorisation factors are expected to influence the final design of the solar energy facility and could result in small-scale modifications of the PV array and/or associated infrastructure. An objective of the Engineering, Procurement and Construction (EPC) Contractor, who will be responsible for the overall construction of the project, will be to comply with the approved facility design as far as possible. It should be understood however, that the construction process is dynamic and that unforeseen changes to the project specifications may take place. This EIA Report therefore describes the project in terms of the best available knowledge at the time. Should there be any substantive changes or deviations from the original facility layout of the project, the DFFE will be notified and where relevant, the final facility design approved by the DFFE.

Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to, confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, on-site facility substation and the associated infrastructure) and a geotechnical survey. Geotechnical surveys acquire information regarding the physical characteristics of soil and rocks underlying a proposed project site and inform the design of earthworks and foundations for structures.

2.3.2. Construction Phase

The construction phase will take approximately 12 to 18 months to complete, and will entail a series of activities including:

Procurement and employment

At the peak of construction, the project is likely to create a maximum of 350 employment opportunities. These employment opportunities will be temporary and will last for a period of approximately 12 to 18 months (i.e. the length of construction). Employment opportunities generated during the construction phase will include low skilled, semi-skilled, and skilled opportunities. Solar PV projects make use of high levels of unskilled and semi-skilled labour so there will be good opportunity to use local labour, where available. Employment opportunities will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

The majority of the labour force is expected to be sourced from the surrounding towns, with a man camp housing the employees during the construction phase.

Establishment of an Access Road

Access to the development area will be established for the construction and operation of Barleria PV facility. Access to the project site will be via an existing gravel District Road (D2435) of approximately 2.5 km in length, which will need to be upgraded to cater for the construction vehicles navigating the road to the laydown areas on site.

Undertake Site Preparation

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

Transport of Components and Equipment to Site

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

Establishment of Laydown Areas on Site

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

Erect PV Panels and Associated Infrastructure

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

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

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

¹ A permit will be required in accordance with Section 81 of the National Road Traffic Act (No. 93 of 1996) (NRTA) which pertains to vehicles and loads which may be exempted from provisions of Act.

Undertake Site Rehabilitation

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

2.3.3. Operation Phase

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

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

2.3.4. Decommissioning Phase

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

Site Preparation

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

Disassembly and removal of existing components

When the solar energy facility is ultimately decommissioned, the equipment to be removed will depend on the land use proposed for the project site at the time. All above ground facilities that are not intended for future use will be removed. Much of the above ground wire, steel, and PV panels of which the system is comprised are recyclable materials and would be recycled to the extent feasible. The components of the solar energy facility would be de-constructed and recycled, or disposed of in accordance with applicable regulatory requirements. The site will be rehabilitated where required and can potentially be returned to a beneficial land-use.

Future plans for the site and infrastructure after decommissioning

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

2.4 Findings of the Environmental Impact Assessment (EIA)

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

The potential environmental impacts associated with Barleria PV identified and assessed through the EIA process include:

- » Impacts on ecology, flora and fauna.
- » Impacts on freshwater.
- » Impacts on avifauna.
- » Soils and Agricultural Potential
- » Impacts on heritage resources, including archaeology and palaeontology.
- » Visual impacts on the area imposed by the components of the facility.
- » Positive and negative socio- economic impacts.

From the specialist studies undertaken in the EIA process, the following aspects do not require any further assessment:

» *Freshwater features*

The DFFE Screening Tool (refer to **Appendix J**) identified the aquatic biodiversity sensitivity of the project site as being very high. However, following a desktop mapping exercise and a field survey undertaken by the Ecological Specialist in June 2021 (refer to **Appendix D**) it was confirmed that no freshwater resource features are located within the project site or within close proximity to the site. No surface freshwater resource features will, therefore, be impacted by the development, and as such further assessment of freshwater resource features (during the EIA phase) will not be necessary.

» *Cultural Landscape*

Based on the findings of the heritage screening report (refer to **Appendix G**), which included the consideration of the cultural landscape, the area proposed for development has not been identified as part of a special or recognised cultural landscape and, as such, no further assessment of impacts to the cultural landscape (during the EIA Phase) is recommended or considered necessary. This is in line with the low sensitivity rating for cultural heritage as per the DFFE Screening Tool (refer to **Appendix J**)

2.4.1 *Impacts on Ecology*

The Terrestrial Ecology Assessment (Appendix D) undertaken determined that there are no impacts associated with the Barleria PV Energy facility project that cannot be mitigated to an acceptable level and as such, the assessed layout was considered acceptable. It was found that the bulk of project site is located within secondary grassland whilst to the north the vegetation comprises of a mostly natural savanna grassland type characterized by *Senegalia hereroensis*, whilst to the south of the project site the vegetation is characterised

by a slightly degraded to near-natural savanna grassland type characterized by *Searsia pyroides*. Both of these grasslands are variations of the Carletonville Dolomite Grassland vegetation type which is listed as Least Threatened.

A section of the eastern portion of the project site is located within an ESA1 (Corridor/Linkage). Due to the large extent of this ESA1, and the availability of ample natural to near natural areas still available the development will not have a significant impact on this ESA, and its ability to function as an important corridor.

Overall, there are no specific long-term impacts likely to be associated with the development of the Barleria PV project that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

2.4.2 Impacts on Avifauna

The Avifauna Impact Assessment, which considered 2 seasons of pre-construction bird monitoring, determined the significance of potential avifauna impact to be moderate to low after mitigation (depending on the type of impact). The study site is not located near any prominent wetland system or impoundment, and therefore the risk of waterbird collisions with the proposed infrastructure was considered to be low. However, in the absence of sufficient information on the occurrence and rate of passing waterbirds, it was recommended that supporting evidence be acquired by means of peak wet season before construction (pre-construction surveys).

The endangered Cape Vulture (*Gyps coprotheres*) and critically endangered White-backed Vulture (*Gyps africanus*) (and to a lesser degree also Lappet-faced Vulture *Torgos tracheliotos*) were identified as regular foraging visitors to the study site (according to SABAP2 reporting rates and on-site observations). These species are highly prone to power line collisions, whereby the proposed energy facility (especially the proposed overhead power lines) could pose a collision and electrocution risk to vultures. The risk of collision/electrocution was considered likely when vultures feed on a carcass in close proximity to a power line or when attempting to roost on the pylon structures.

No fatal-flaws were identified during the assessment of the PV Facility. Impacts related to avian collision and electrocution with overhead power lines between LLO alternative 1 and 2 were also considered not to be fatal flaws regardless of the alternative layout. Nevertheless, it is recommended by the specialist that the proposed mitigation measures and monitoring protocols (additional with pre- and post construction monitoring) be implemented during the construction and operational phase of the project.

2.4.3 Soils and Agricultural Potential

The soil forms present within the development area consist mostly of shallow soils underlain by lithic material or rock that has severe limitations to rainfed crop production. The current agricultural land use is livestock farming and the land has never been used for rainfed or irrigated crop production. There are also no irrigation infrastructure, such as centre pivots or drip irrigation, present within the project area. Considering the soil properties, land capability and agricultural potential of the development area, the entire area has Low Agricultural Sensitivity.

It is anticipated that the construction and operation of the Barleria PV facility and associated Infrastructure will have impacts that range from medium to low. Through the consistent implementation of the recommendation mitigation measures, most of impacts can all be reduced to low. All grid connection alternatives are also considered to be acceptable. It is therefore the specialists opinion that the proposed

development is considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed project area that will be fenced off.

2.4.4 Impacts on Heritage Resources

A stone structure was identified within the development area. It is likely that this is a burial site (LCTB013/LICBUR6). This site is graded IIIA and a no-development buffer of 10m is recommended around this site.² The impact rating was determined to be of low significance with mitigation, where required.

Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary. No fossils were seen during the site survey and there were no rocky outcrops at all.

The specialists has no objection to the proposed development of the Barleria PV facility on heritage grounds on condition that the 10m no-go buffer be implemented, a management plan is developed for the ongoing and long-term management of the burials within the development area, and a Chance Fossil Finds Procedure must be implemented for the duration of the construction phase of the project. In addition, from a heritage and paleontological perspective both grid connection alternatives are considered acceptable.

2.4.5 Visual Impacts

The anticipated visual impacts associated with the construction and operational phases of the Barleria PV Facility and associated infrastructure range from moderated to low significance. These anticipated visual impacts on sensitive visual receptors, if and where present, in close proximity to the proposed facility (Scherppunt, Houthaalbomen 1 and 2, the western residences within the Elandsfontein agricultural holdings, and observers travelling along the R503 arterial road south of the facility) are not considered to be fatal flaws for the proposed PV facility.

In the specialist's opinion, considering all factors, it is recommended that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures and management programme. Grid Although both grid connection alternatives, are acceptable, grid connection Alternative 2 is more preferred as it will remove the substation and switching station further away from the Elandsfontein small holdings and placing it in closer proximity to the other PV facility infrastructure.

2.4.6 Social Impacts

The social impacts identified (including all positive and negative impacts) will be either of a low or medium significance. No negative impacts with a high significance rating have been identified to be associated with the development of the Barleria PV Facility and associated infrastructure. All negative social impacts are within acceptable limits with no impacts considered as unacceptable from a social perspective. The recommendations proposed for the project are appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts. Barleria PV Facility is supported at a national,

² The development footprint assessed in this EIA Report has considered the 10m heritage site buffer, and have excluded these buffer areas from the PV facility layout.

provincial, and local level, and that the proposed project will contribute positively towards a number of targets and policy aims.

Based on the findings of the SIA the proposed establishment of the Barleria PV is supported.

2.4.7 Traffic Impacts

The impact of the construction trip generation, on the predicted 2023 traffic volumes near the town of Lichtenburg and along the transportation routes, are expected to be low. No mitigation measures (upgrading of existing intersections) will be necessary. The direct impact and significance of the Barleria PV Facility is considered low negative and low positive for the traffic and community parameters, respectively. It is the reasoned opinion of the specialist that Barleria PV Facility can be authorised from a traffic perspective.

2.4.8 Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa and within the surrounding areas of the development area. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional, and national level have the potential to be significant.

Based on the specialist cumulative assessment and findings (Appendix D to Appendix J and Chapter 8 of the EIA), the development of Barleria PV and its contribution to the overall impact of all existing and proposed solar energy facilities within a 30km radius, it can be concluded that cumulative impacts will be of a low to high significance, with impacts of a high significance mainly relating to impacts on avifauna. There are however no impacts or risks identified to be considered as unacceptable with the development of Barleria PV and other solar energy facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

2.5 Environmental Sensitivity

As part of the specialist investigations undertaken within the project development area, which includes the development footprint, specific environmental features and areas were identified which will be impacted by the placement of the Barleria PV Facility and associated infrastructure. The current condition of the features identified (i.e. intact or disturbed) will inform the sensitivity of the environmental features and its capacity for disturbance and change associated with the proposed development.

Ecological Sensitive Features

- » Low Medium Ecological Sensitivity:
From a terrestrial ecological perspective, it was found that the bulk of project site is located within secondary grassland.
- » Medium Ecological Sensitivity:
Portions of primary grassland and a section of the eastern portion of the project site is located within an ESA1 (Corridor/Linkage). Due to the large extent of this ESA1, and the availability of ample natural

to near natural areas still available the development will not have a significant impact on this ESA, and its ability to function as an important corridor.

No high sensitive features and “No-Go” areas were identified within the project area.

There are no areas identified which are required to be excluded from the proposed development footprint.

Avifauna Sensitive Features

Open mixed woodland, artificial livestock watering points and extensive open grassland and bush clump mosaics habitat units comprising of potential sensitive avifauna features have been observed on the project site. The following preliminary avifauna sensitivities have been identified:

- » Medium Avifauna Sensitivity:
 - Medium sensitivity habitats units include the extensive open grassland and bush clump mosaics.
 - Abundance of threatened and near threatened bird species are anticipated to be relatively low, thereby suggesting a medium sensitivity rating instead of a high sensitivity even though the majority of the habitat is natural. In addition, the open grassland and bush clump mosaics are widespread in the region.

There are no areas identified which are required to be excluded from the proposed development footprint.

Soils and agricultural potential Sensitive Features

All of the components associated with the Barleria PV project area are located on land potential areas of Low sensitivity. No no-go areas have been identified and no buffers have been recommended.

Heritage sensitive features, the cultural landscape (incl. archaeology, palaeontology, and cultural landscape)

A number of stone structures were identified within the development area. It is likely that a number of these are burial sites (LICBUR1, LICBUR2, LICBUR6, LICBUR10, LI9, LI13 and LI14). These have been graded IIIA and a no-development buffer of 10m is recommended around these sites.

Sense of Place

Overall, the significance of the visual impacts is expected to range from moderate to low as a result of the generally undeveloped character of the landscape. The facility would be visible within an area that incorporates certain sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along roads (R505, R503, and provincial main roads) and residents of surrounding agricultural holdings. No no-go areas have been identified and no buffers have been recommended.

2.6 Considerations of Alternatives

Two alternative grid connection solutions within a 100m wide corridor were considered as part of this assessment. The grid connections alternatives assessed are as follows:

Grid Connection Alternative 1: 33kV cabling will connect the Barleria PV facility solar array to the 132kV facility substation. The facility substation and Eskom switching station are located directly adjacent to each other approximately 2.2km east of the eastern boundary of the Barleria PV facility development area, on Portion 1 of the Farm Houthaalboomen 31. A 132kV loop-in-loop out power line from the Eskom switching station will connect into the Delareyville Munic–Watershed 1 88kV³.

Grid Connection Alternative 2: 33kV cabling will connect the Barleria PV facility solar array to the 132kV facility substation. The facility substation and Eskom switching station are located directly adjacent to each other approximately 991m east of eastern boundary of the Barleria PV facility development area, on Portion 1 of the Farm Houthaalboomen 31. A 132kV loop-in-loop out power line from the Eskom switching station will connect into the Delareyville Munic–Watershed 1 88kV.

As part of specialist assessments both alternative grid connection solutions were assessed and determined to be acceptable from an environmental perspective. A summary of the assessment of impacts for the grid connection and associated infrastructure alternatives are detailed below:

Aspect	Grid Connection Alternative 1	Grid Connection Alternative 2
Ecology	<i>Acceptable</i>	<i>Preferred & Acceptable</i>
Avifauna	<i>Acceptable</i>	<i>Preferred & Acceptable</i>
Heritage	<i>Acceptable</i>	<i>Acceptable</i>
Visual	<i>Acceptable</i>	<i>Preferred & Acceptable</i>

Although Grid Connection Corridor Alternative 2 is the preferred alternative from an ecological, avifauna, and visual perspective, it has been indicated by the respective specialists that all impacts on both grid connection corridor alternatives can be mitigated to acceptable levels and therefore both alternatives are considered to be environmentally acceptable.

Grid Connection Corridor Alternative 1 was identified by the developer as the preferred alternative from a technical feasibility perspective, due to its strategic location allowing it to potentially act as a broader collector switching station for future planned projects. This grid alternative has been fully considered and assessed as part of the Scoping/EIA process and within this EIA report to be acceptable from an environmental perspective. Grid Connection Corridor Alternative 2 is less preferred from the technical perspective due to the location being surrounded by an adjacent PV facility to the west, north and east, and constrained by existing power lines to the south. This infrastructure will inhibit the entry of the high voltage feeder lines into the Eskom collector switching station, which renders the alternative technically less preferred.

2.7 Overall Conclusion and Recommendations

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development site, the avoidance of the sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Barleria PV Facility is acceptable within the landscape and can reasonably be authorised. The proposed layout as provided by

³ The LILO corridor intersects with several existing parallel Eskom power lines (Watershed-Sephaku 1 132kV, Dudfield–Watershed 2 88kV, Dudfield–Watershed 1 88kV and Watershed–Klerksdorp North 1 132kV). Therefore, should the connection to the Delareyville Munic–Watershed 1 88kV not be technically feasible, connection to the above-mentioned power lines would still be within the assessed LILO corridor and considered feasible through the construction of a shorter LILO connection.

the developer is considered to be the most appropriate from an environmental perspective as it avoids identified sensitivities and recommended buffer areas.

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

Grid Connection Alternative 1: 33kV cabling will connect the Barleria PV facility solar array to the 132kV facility substation. The facility substation and Eskom switching station are located directly adjacent to each other approximately 2.2km east of the eastern boundary of the Barleria PV facility development area, on Portion 1 of the Farm Houthaalboomen 31. A 132kV loop-in-loop out power line from the Eskom switching station will connect into the Delareyville Munic–Watershed 1 88kV .

The key infrastructure for the grid connection described above are as follows:

Grid connection solution within a 100m wide corridor, including:

- 33kV cabling between the project components and the facility substation
- A 132kV facility substation
- A 132kV Eskom switching station
- A Loop-in-Loop out (LILO) overhead 132kV power line between the Eskom switching station and the existing Delareyville Munic–Watershed 1 88kV power line.

PV modules and mounting structures

Inverters and transformers

BESS, Construction and O&M hub:

- Battery Energy Storage System (BESS)
- Temporary and permanent laydown area
- Site offices and maintenance buildings, including workshop areas for maintenance and storage

Site and internal access roads (up to 8m wide)

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

- » All mitigation measures detailed within this EIA report, as well as the specialist reports contained within Appendices D to L are to be implemented.
- » The EMPr as contained within Appendix M of this EIA report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Barleria PV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
- » Following the final design of the Barleria PV Facility, a revised layout must be submitted to DFFE for review and approval prior to commencing with construction. No development is permitted within the identified no-go areas as detailed in Figure 9.2.
- » A pre-construction walk-through of the final layout, including roads and underground cables, should be undertaken before construction commences and adjusted where required to reduce impacts on species of conservation concern and habitats of concern.
- » A detailed site-specific eradication and management programme for alien invasive plants must be developed and implemented.
- » Before construction commences individuals of listed species within the development footprint that would be affected, must be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey. Permits from the relevant national and provincial authorities, must be obtained before the individuals are disturbed.

- » Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- » If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
- » Maintain vegetation cover (i.e. either natural or cultivated) immediately adjacent to the actual development footprint, both during construction and operation of the proposed facility.
- » Monitor all rehabilitated areas for one year following decommissioning and implement remedial actions as and when required.

A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

CHAPTER 3 : PURPOSE AND OBJECTIVES OF THE EMPr

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

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

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

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended) (refer to Table 4.1). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for Barleria PV and/or as the project develops. This will ensure that the construction and operation activities are planned and implemented taking sensitive environmental features into account. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

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 Barleria PV.
- » Ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » Identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » Propose mechanisms and frequency for monitoring compliance, and prevent long-term or permanent environmental degradation.
- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the EIA process.

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

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

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

CHAPTER 4: STRUCTURE OF THIS EMPr

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

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

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

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

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

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

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

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

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

4.1 Contents of this Environmental Management Programme (EMPr)

This Environmental Management Programme (EMPr) has been prepared as part of the EIA process being conducted in support of the application for Environmental Authorisation (EA) for the Barleria PV. This EMPr has been prepared in accordance with DFFE's requirements as contained in Appendix 4 of the 2014 EIA Regulations (GNR 326), and within the Acceptance of Scoping dated 29 January 2019. It provides recommended management and mitigation measures with which to minimise impacts and enhance benefits associated with the project.

An overview of the contents of this EMPr, as prescribed by Appendix 4 of the 2014 EIA Regulations (GNR 326), and where the corresponding information can be found within this EMPr is provided in Table 4.1.

Table 4.1: Summary of where the requirements of Appendix 4 of the 2014 NEMA EIA Regulations (GNR 326) are provided in this EMPr.

Requirement	Location in this EMPr
(1) An EMPr must comply with section 24N of the Act and include –	
(a) Details of –	Chapter 4 Appendix K
(i) The EAP who prepared the EMPr.	
(ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	
(b) A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.	Chapter 2
(c) A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.	Chapter 2 Figure 2.2 to Figure 2.4 Appendix A
(d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –	
(i) Planning and design.	Chapter 5
(ii) Pre-construction activities.	Chapter 5
(iii) Construction activities.	Chapter 6
(iv) Rehabilitation of the environment after construction and where applicable post closure.	Chapter 7
(v) Where relevant, operation activities.	Chapter 8
(f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to –	
(i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation.	Chapters 5 - 8
(ii) Comply with any prescribed environmental management standards or practices.	

Requirement	Location in this EMPr
(iii) Comply with any applicable provisions of the Act regarding closure, where applicable.	
(iv) Comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable.	
(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(i) An indication of the persons who will be responsible for the implementation of the impact management actions.	Chapters 5 - 8
(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.	Chapters 5 - 8
(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.	Chapter 6
(m) An environmental awareness plan describing the manner in which – (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work. (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Chapter 6
(n) Any specific information that may be required by the competent authority.	Table 4.2
(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

4.2 Project Team

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326) the applicant appointed Savannah Environmental (Pty) Ltd as the independent environmental consultants responsible for managing the application for EA and the supporting EIA process. The application for EA and the EIA process, is being managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

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

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned), and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

This EIA process is being managed by Karen Jodas. She is supported by Rendani Rasivhetshela, Jana de Jager and Nicolene Venter.

- » **Karen Jodas** is a Director at Savannah Environmental (Pty) Ltd. Karen holds a Master of Science Degree from Rhodes University and is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP). She has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation and transmission projects through her involvement in related EIA processes over the past 20 years. She has successfully managed and undertaken EIA processes for infrastructure development projects throughout South Africa.
- » **Rendani Rasivhetshela** is the principle author of this report. She is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA), and she holds a Bachelor of Science Honours in Environmental Management. She has over 4 years of experience in conducting Environmental Impacts Assessments, public participation, and Environmental Management Programme for a wide range of projects including renewable energy projects. She is responsible for overall compilation of the report, this includes specialists' engagements, reviewing specialists reports and incorporating specialist studies into the Environmental Impact Assessment report and its associated Environmental Management.
- » **Jana de Jager** is the co-author of this report. She holds a bachelor's degree in Environmental Science, an Honours degree in Geography and Environmental Science and is currently undertaking her MSc in Ecological Water Requirements. She has 3.5 years of experience in the environmental management field. Her key focus is on undertaking environmental impact assessments, GIS mapping, public participation, environmental management plans and programmes. She is registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).
- » **Nicolene Venter** has over 20 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned) and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies since 2006, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development. Curricula Vitae (CVs) detailing the Savannah Environmental team's expertise and relevant experience are provided in **Appendix K** of the EMPr.

4.2.2 Details of the Specialist Consultants

A number of independent specialist consultants have been appointed as part of the EIA project team in order to adequately identify and assess potential impacts associated with the project (refer to **Table 4.1**). The specialist consultants have provided input into the EIA Report as well as this EMPr.

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

Company	Specialist Area of Expertise	Specialist Name
Nkurenkuru Ecology & Biodiversity	Ecology and Wetlands	Gerhard Botha
Pachnoda Consulting	Avifauna	Lukas Niemand
Terra Africa Environmental Consultants	Soils and Agricultural Potential	Marinè Pienaar
LOGIS	Visual	Lourens du Plessis

Company	Specialist Area of Expertise	Specialist Name
CTS Heritage	Heritage and Palaeontology	Jenna Lavin
Savannah Environmental	Social environment	Nondumiso Bulunga
BVi Consulting Engineers Western Cape (Pty) Ltd	Traffic	Jacques Nel and Dirk van der Merwe
SRK Consulting	Stormwater, Wastewater and Erosion Management plan	S. Seroalo and B. Engelsman

CHAPTER 5: PLANNING AND DESIGN MANAGEMENT PROGRAMME

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

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

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

5.1 Objectives

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

Subject to final Subject to final facility micro-siting and subsequent acceptance from DFFE, the development footprint detailed in Figure 2.3 must be implemented. Cognisance of sensitive areas defined in Figure 2.3 and within the EIA Report should be considered when undertaking the final design of the facility.

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

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer Contractor	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Developer Geotechnical specialist	Pre-construction
Finalise layout of all components, and submit to DFFE for approval prior to commencement of construction.	Developer	Prior to construction
The EMPr should form part of the contract with the Contractors appointed to construct the PV facility and associated infrastructure,, and must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.	Developer Contractor	Tender Design and Design Review Stage
Plan the placement of laydown areas and assembly plant in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible and to avoid habitat loss and disturbance to adjoining areas.	Developer	Pre-construction
The construction equipment camps must be planned as close to the site as possible to minimise impacts on the environment.	Developer	Pre-construction
Ensure that laydown areas and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible.	Developer	Project planning
Plan development levels to minimise earthworks to ensure that levels are not elevated.	Developer	Project planning
Plan to apply bird deterrent devices to the PV panels to discourage birds from colonising the infrastructure or to discourage birds from constructing nests. These could include visual or bio-acoustic deterrents such as highly reflective rotating devices, anti-perching devices such as bird guards, scaring or chasing activities involving the use of trained dogs or raptors and/or netting.	Developer Contractor	Planning & Design
The construction site must be fenced off. The fence around the facility should be designed to be animal and bird friendly, to prevent entrapment and electrocutions of ground-dwelling birds and animals. In practical terms this means that the perimeter fence of the facility should only include the developed areas and as little undeveloped ground or natural veld as possible. No electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.	Developer	Project planning
Clear rules and regulations for access to the proposed site must be developed.	Developer Contractor	Pre-Construction

Mitigation: Action/Control	Responsibility	Timeframe
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.	Developer	Planning and design
Plan and placement of light fixtures for the plant and the ancillary infrastructure in such a manner so as to minimise glare and impacts on the surrounding area.	Developer Contractor	Planning
New elements should be designed to blend as naturally as possible with their backdrop.	Developer Design engineer	Design and planning
Plan to maintain the height of structures as low as possible.	Developer Design engineer	Design and planning
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development	Developer Design engineer	Design and planning
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer Contractor	Pre-construction
Consider planning and design level mitigation measures recommended by the specialists as part of the EIA process.	Engineering Design Consultant	Design Phase

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Preconstruction walk-through of the final development footprint for protected species that would be affected and that can be translocated. A large proportion of the identified protected species at the site are geophytic (e.g. <i>Babiana hypogea</i> , <i>Schizocarphus nervosus</i> and <i>Gladiolus</i> spp.), the potential for successful translocation is high. 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.	Developer Specialist	Pre-construction
Obtain abnormal load permits for transportation of project components to site (if required).	Contractor(s)	Pre-construction
An avifaunal specialist should conduct at least one additional pre-construction survey, consisting of a minimum of 1-2 days which is necessary to inform the final EMPr during operation. The survey should coincide with the peak wet season when most of the drainage lines and wetland features in the wider study region are inundated. This will enable the observer to obtain quantified data on waterbird richness and potential flyways, which will contribute towards the understanding of impacts related to collision trauma with the panels.	Developer Specialist	Pre-construction
Permits from the relevant provincial authorities, will be required to relocate and/or disturb listed plant species.	Developer	Pre-construction
A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found.	Developer Contractor	Pre-construction
Prepare a detailed Fire Management Plan (FMP) in collaboration with surrounding landowners.	Developer	Pre-construction
Communicate the FMP to surrounding landowners and maintain records thereof.	Developer	Pre-construction Construction
A Stormwater Management Plan (SWMP) should be developed and should provide for a drainage system sufficiently designed to prevent water run-off from the solar panels to cause soil erosion.	Developer Design engineer	Pre-construction
Compile a procedure for the safe handling of battery cells during transportation and installation	Developer Design engineer	Pre-construction
Develop and implement an alien, invasives and weeds eradication/control plan	Developer Specialist	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Permits are obtained and relevant conditions complied with. » Impact on protected plant species reduced to some degree through Search and Rescue. » Relevant management plans and Method Statements prepared and implemented.
Monitoring	<ul style="list-style-type: none"> » Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction. » Monitor ongoing compliance with the EMP and method statements.

OBJECTIVE 4: Ensure appropriate planning is undertaken by contractors

Project Component/s	<ul style="list-style-type: none"> » PV panels » Access roads » Inverter stations » Transformer » BESS » Underground cabling » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Impact on identified sensitive areas. » Design and planning fail to respond optimally to the environmental considerations.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of all project components » Pre-construction activities. » Positioning of temporary sites. » Employment and procurement procedures.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the design of the PV facility responds to the identified environmental constraints and opportunities. » To ensure that pre-construction activities are undertaken in an environmentally friendly manner.

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 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

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

OBJECTIVE 5: Ensure effective communication mechanisms

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

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

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public to be implemented during both the construction and operation phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operation and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaising with landowners must be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Developer Contractor	Pre-construction
Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for	Contractor	Pre-construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), must be informed of the details of the contractors, size of the workforce and construction schedules.	Developer Contractor	Pre-construction and construction
Clearly inform the local municipality of the potential impact of the proposed project in order for the necessary preparations to take place	Developer	Pre-construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	<ul style="list-style-type: none"> » A Public Complaints register must be maintained, by the Contractor to record all complaints and queries relating to the project and the action taken to resolve the issue. » All correspondence should be in writing. » Developer and contractor must keep a record of local recruitments and information on local labour; to be shared with the ECO for reporting purposes during construction.

CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION

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

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

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

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

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

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

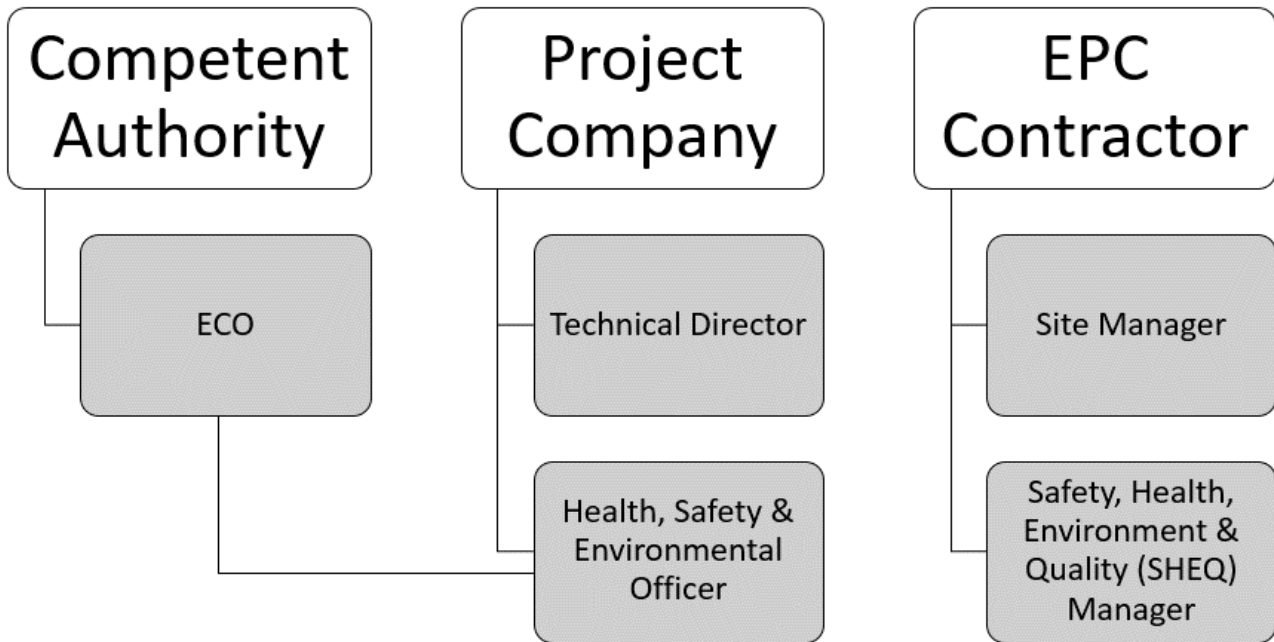


Figure 6.4: Organisational structure for the implementation of the EMPr

Construction Manager will:

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

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

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

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

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

- » Be fully knowledgeable of the contents of the EIA.
- » Be fully knowledgeable of the contents of the conditions of the EA (once issued).
- » Be fully knowledgeable of the contents of the EMPr.
- » Be fully knowledgeable of the contents of all relevant environmental legislation, and ensure compliance therewith.
- » Be fully knowledgeable with the contents of all relevant licences and permits issued for the project.
- » Ensure that the contents of the EMPr are communicated to the Contractors site staff and that the Site Manager and Contractors are constantly made aware of the contents through ongoing discussion.
- » Ensure that compliance with the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Independently report to the Department of Forestry, Fisheries and the Environment (DFFE) in terms of compliance with the specifications of the EMPr and conditions of the EA (once issued).
- » Keep records of all reports submitted to DFFE.

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter, weekly site compliance inspections would probably be sufficient, which must be increased if required. The ECO will be supplemented with the EPC Contractor's/Project Company's Environmental Office (EO) who will be located on site on a daily basis and will guide the EPC Contractor's/Project Company's to ensure compliance with the environmental considerations. Therefore, in the absence of the ECO there will be a designated owner's environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

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

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

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

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

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

- » Must be fully knowledgeable on all environmental features of the construction site and the surrounding environment.
- » Be fully knowledgeable with the contents and the conditions of the Environmental Authorisation.
- » Be fully knowledgeable with the contents with the EMPr.
- » Be fully knowledgeable of all the licences and permits issued for the site.
- » Ensure a copy of the Environmental Authorisation and EMPr is easily accessible to all on-site staff members.
- » Ensure contractor employees are familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
- » Ensure that prior to commencing any site works, all contractor employees and sub-contractors must have attended environmental awareness training included in the induction training which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.

- » Ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.
- » Manage the day-to-day on-site implementation of this EMPr, and the compilation of regular (usually weekly) Monitoring Reports.
- » Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken, including those of the Independent ECO.
- » Inform staff of the environmental issues as deemed necessary by the Independent ECO.

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

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

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

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

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

6.2 Objectives

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

OBJECTIVE 2: Minimise impacts related to inappropriate site establishment

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Contractor's Environmental Officer (EO) must provide supervision and oversight of vegetation clearing activities within sensitive areas.	Contractor	Construction
Any individuals of protected species affected by and observed within the development footprint during construction should be translocated under the supervision of the Contractor's SHE or EO.	SHE/EO Specialist	Construction
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Contractor	Construction
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Construction
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
The construction site must be fenced and security provided.	Contractor	Construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes.	Contractor	Construction
All unattended open excavations must be adequately demarcated and/or fenced.	Contractor	Construction
Establish appropriately bunded areas for storage of hazardous materials (e.g. fuel to be required during construction).	Contractor	Site establishment, and duration of construction
Visual impacts must be reduced during construction through minimising areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soil as closely as possible to their original contour and vegetation.	Contractor	Site establishment, and duration of construction
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but must be temporarily stored in a demarcated area.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers so that the surrounding environment is not polluted (at least one sanitary facility for each sex and for every 30 workers as per the 2014 Construction Regulations; Section 30(1) (b)) at appropriate locations on site). The facilities must be placed within the construction area and along the road.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities must not be located within 100m from a watercourse or within the 1:100 year flood.	Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at the site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. Provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction
Construct stormwater drains or bunds to divert clean runoff around dirty areas. The diversion should be sized for 1 in 5-year event. Typical design will be an excavated earth channel or berms.	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Foundations and trenches must be backfilled to originally excavated materials as much as possible. Excess excavation materials must be disposed of only in approved areas, or, if suitable, stockpiled for use in reclamation activities.	Contractor	Site establishment, and duration of construction and rehabilitation
Eskom's rights and services must be acknowledged and respected at all times. Eskom shall at all times retain unobstructed access to and egress from its servitudes.	Contractor	Site establishment, and duration of construction, rehabilitation and operation

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site. » Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.
Monitoring	<ul style="list-style-type: none"> » An incident reporting system is used to record non-conformances to the EMPr. » EO and ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager. » Monitoring of vegetation clearing during construction (by contractor as part of construction contract). » Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Restrict public access to works area including construction areas, laydown and storage sites via appropriate security. Only allow site access after appropriate induction and use of appropriate personal protective equipment	Contractors	Construction
Contractors and construction workers must be clearly informed of the no-go, very high and high sensitivity areas.	Developer Contractor	Prior to the commencement of construction
In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the EIA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.	Contractors	Construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	Contractor and sub-contractor/s	Pre-construction
Introduce an incident reporting system to be tabled at weekly/monthly project meetings.	Contractor and sub-contractor/s	Pre-construction
All construction vehicles must adhere to clearly defined and demarcated roads. No driving outside of the development boundary must be permitted.	Contractor	Construction
Ensure all construction equipment and vehicles are properly maintained at all times.	Contractor	Construction
Avoid parking of vehicles and equipment outside of designated parking areas.	Contractor	Site establishment, and during construction
Restrict work activities that require power tools and plant that generates noise to normal working hours and limit such activities over weekends.	Contractor	Construction
Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.	Contractor	Construction
Appoint a community liaison officer to deal with complaints and grievances from the public.	Contractor	Construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community and/or environment.	Contractor	Construction
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Personnel trained in first aid should be on site to deal with smaller incidents that require medical attention.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan must be developed with emergency procedures in the event of a fire.	Contractor	Site establishment, and during construction
Encourage contractors and local people to report any suspicious activity associated with crime to the appropriate authorities.	Contractor	Construction
Ensure that the local municipalities, police, security companies, and policing forums are alerted to the increased construction activities in the region and the risk it poses in respect of crime.	Contractor	Duration of Contract
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	During construction.
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permited waste disposal site. Ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Duration of contract
A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.	Contractor	Construction
No disturbance of flora or fauna must be undertaken outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Workers must be aware of the importance of watercourses and drainage systems (especially those located within and	Contractor and EO	Pre-construction Construction

Mitigation: Action/Control	Responsibility	Timeframe
surrounding the project site) and the significance of not undertaking activities that could result in such pollution.		
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction
When possible, no activity should be undertaken at the site between sunset and sunrise, except for security personnel guarding the development.	Contractor and sub-contractor/s	Construction
Keep record of all accidents or transgressions of safety in accordance with OHS Act and implement corrective action.	Contractor	Construction
Implement an HIV/AIDS Awareness and Training Programme for the Contractor's workforce and if feasible the local community within two weeks of commencement of construction. Ensure that the HIV/AIDS Awareness and Training Programme is consistent with national guidelines and/or IFC's Good Practice.	Contractor	Construction
Provide voluntary and free counselling, free testing and condom distribution services.	Contractor	Construction

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

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

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

Project Component/s	» Construction activities associated with the establishment of the PV facility.
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	» Availability of required skills in the local communities for the undertaking of the construction activities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	<ul style="list-style-type: none"> » Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area. » Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Higher skilled positions might be sourced internationally, where required.
Enhancement: Target/Objective	<ul style="list-style-type: none"> » The contractor should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors. » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building.

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

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

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited to the minimum necessary to accommodate the required infrastructure.	Contractor	Duration of contract
Any individuals of protected species affected by and observed within the development footprint during construction should be translocated under the supervision of the ECO and/or Contractor's Environmental Officer (EO).	Contractor EO	Construction
Land clearance must only be undertaken immediately prior to construction activities.	Contractor	Construction
Ensure that laydown areas, construction camps and other temporary use areas are located in areas of low and medium sensitivity and are properly fenced or demarcated as appropriate and practically possible.	Contractor	Construction
Retain and augment natural vegetation on all sides of the proposed project.	Contractor	Construction
During vegetation clearance, methods should be employed to minimise potential harm to fauna species.	Contractor	Construction
Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery.	Contractor	Construction
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing. No vegetation removal must be allowed outside the designated project development footprint. Restrict construction activity to demarcated areas.	Contractor	Duration of Construction
Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time. Where possible work should be restricted to one area at a time.	Contractor	Construction
Access to adjacent areas to be strictly controlled.	Developer Contractor	Pre-construction Construction
No harvesting of plants for firewood, medicinal or any other purposes are to be permitted	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
No killing and poaching of any wild animal to be allowed. This should be clearly communicated to all employees, including subcontractors.	Contractor	Construction
Enforce ban on hunting, collecting etc. of all plants and animals or their products.	Contractor EO	Construction
Areas beyond the development footprint should be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.	Contractor	Construction
If trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	Contractor	Construction
Any fauna threatened or injured during construction should be removed to safety by a suitably qualified person, or allowed to passively vacate the area.	Suitably qualified person	Construction
Education of employees on the conservation importance of natural areas and fauna must be provided.	Contractor	Construction
Access to high sensitivity and no-go areas to be restricted and controlled. This should be clearly communicated to all employees.	Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads	Contractor	Construction
No collecting of flora species to be permitted.	Contractor	Construction
Topsoil must be removed and stored separately from subsoil and must be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.	Contractor	Construction
Soil stockpiles must not exceed 2 m in height.	Contractor	Construction
Soil stockpiles must be dampened with dust suppressant or equivalent to prevent erosion by wind.	Contractor	Construction
Soil stockpiles must be located away from any waterway or preferential water flow path in the landscape, to minimise soil erosion from these	Contractor	Construction
All graded or disturbed areas which will not be covered by permanent infrastructure such as paving, buildings or roads must be stabilised using appropriate erosion control measures.	Contractor	Construction
A method statement must be developed and submitted to the engineer to deal with erosion issues prior to bulk earthworks operations commencing.	Contractor	Before and during construction
Stockpiles are not to be used as stormwater control features.	Contractor	Construction
Any stockpiling of materials may not exceed two metres in height to reduce materials being blown away during high wind velocity events.	Contractor	Construction
Any erosion problems within the development area as a result of the construction activities observed must be rectified immediately and monitored thereafter to ensure that they do not re-occur.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Any signs of soil erosion on site should be documented (including photographic evidence and coordinates of the problem areas) and submitted to the management team for further action.	Contractor	Construction
During construction the contractor shall protect areas susceptible to erosion by installing appropriate temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.	Contractor	construction
Create energy dissipation at discharge areas to prevent scouring	Contractor	construction
Activity at the site must be reduced after large rainfall events when the soils are wet. No driving off of hardened roads should occur at any time and particularly immediately following large rainfall events.	Contractor	Construction
Silt traps or cut-off berms downslope of working areas should be used where there is a danger of topsoil or material stockpiles eroding and entering watercourses and other sensitive areas.	Contractor	Construction
Erosion control measures to be regularly maintained.	Contractor	Construction
Bush clearing of all bushes and trees taller than one meter; Ensure proper storm water management designs are in place.	Contractor	Construction
If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place.	Contractor	Construction
If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Compacted areas are to be ripped to loosen the soil structure.	Contractor	Construction
The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks.	Contractor	Construction
Topsoil is to be stripped when the soil is dry, as to reduce compaction.	Contractor	Construction
The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly	Contractor	Construction
Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles.	Contractor	Construction
The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Compacted areas are to be ripped to loosen the soil structure.	Contractor	Construction
Place the above cleared vegetation were the topsoil stockpiles are to be placed.	Contractor	Construction
All construction vehicles must adhere to a low speed limit (30km/h) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction Operation

Mitigation: Action/Control	Responsibility	Timeframe
Outside lighting should be designed to minimise impacts on fauna.	Contractor	Before construction
All night-lighting should use low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution.	Contractor	Construction
Fluorescent and mercury vapour lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible.	Contractor	Construction
In order to reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered. Noise from vehicles and powered machinery and equipment on-site should not exceed the manufacturer's specifications, based on the installation of a silencer. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.	Contractor	Construction

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

OBJECTIVE 6: Minimise impacts to avifauna

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

Mitigation: Action/Control	Responsibility	Timeframe
Bird deterrent devices must be applied to the PV panels to discourage birds from colonising the infrastructure or to discourage birds from constructing nests. These could include visual or bio-acoustic deterrents such as highly reflective rotating devices, anti-perching devices such as bird guards, scaring or chasing activities involving the use of trained dogs or raptors and/or netting. Nests should be removed when nest-building attempts are noticed.	Contractor	Construction
Killing or poaching of any bird species should be avoided by means of awareness programs presented to the labour force. The labour force should be made aware of the conservation issues pertaining to the bird taxa occurring on the study site. Any person found deliberately harassing any bird species in any way should face disciplinary measures, following the possible dismissal from the site.	Contractor	Construction

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

OBJECTIVE 7: Minimise the establishment and spread of alien invasive plants

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an IAP Control and Eradication Programme.	Contractor	Construction
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants. 	Contractor	Construction
When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.	Contractor	Construction
All alien plant re-growth must be monitored and should it occur these plants should be eradicated	Contractor	Construction
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Contractor	Construction

Performance Indicator	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
Monitoring	<ul style="list-style-type: none"> » On-going monitoring of area by EO during construction. » Annual audit of development footprint and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site. » The environmental manager/site agent should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 9: Appropriate Stormwater Management

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Stormwater from hard stand areas, and roads must be managed using appropriate channels and swales when located within steep areas.	Contractor	Construction
Engineer low velocity temporary drains: Drains sloped and sized such that velocities do not exceed 1 m/s in a 1 in 5-year event	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities	Contractor	Construction
Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving the Solar PV site.	Contractor and Engineers	Construction
Stormwater control systems must be implemented to reduce erosion on the project site.	Contractor	Construction
Silt traps must be used where there is a danger of topsoil eroding and entering streams and other sensitive areas.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No impacts due to runoff. » Minimise erosion as far as possible. » Appropriate storm water management system in place.
Monitoring	<ul style="list-style-type: none"> » Ongoing monitoring of erosion management measures within the site. » Monthly inspections of sediment control devices by the EO. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 10: Protection of heritage resources

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

Mitigation: Action/control	Responsibility	Timeframe
Contractors must be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow if they find sites. All staff should also be familiarised with procedures for dealing with heritage objects/sites.	Contractor, ESA and heritage specialist	Duration of contract, particularly during excavations
Environmental Officer (EO) to alert workers to the importance of reporting fossil bones seen on site and to the possibility of encountering human remains.	EO	Construction
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	Contractor	Construction
A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development	Contractor Heritage specialist	Construction

Mitigation: Action/control	Responsibility	Timeframe
activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.		
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	Heritage Specialist	Pre-construction
In the event that fossils resources are discovered during excavations, immediately stop excavation in the vicinity of the potential material. Mark (flag) the position and also spoil material that may contain fossils. Inform the site foreman and the EO. EO to inform the Developer; the Developer contacts the standby archaeologist and/or palaeontologist. EO to describe the occurrence and provide images by email.	Contractor and EO	Construction
<u>If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Nggalabutho Madida 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</u>	<u>Contractor and EO</u>	<u>Construction</u>
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 or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.	Contractor and EO	Construction
<p>The following conditions apply with regards to the appointment of specialists:</p> <ul style="list-style-type: none"> » a qualified archaeologist must be appointed to undertake the work in terms of the permit applied for as noted above; » If heritage resources are uncovered during the course of the development, a professional archaeologist or paleontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or paleontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. 		
Potential burial sites should be subject to a 10m buffer, unless the appropriate legal procedures are followed to provide evidence that they're not burial sites / human remains. Should an investigation process as approved by SAHRA determine that the potential grave sites are not burials and do not contain any human remains, then the recommendations pertaining to the	Contractor and EO	Construction

Mitigation: Action/control	Responsibility	Timeframe
potential burials (inclusive of the development buffer) are no longer applicable.		
If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;	Contractor and EO	Construction

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

OBJECTIVE 11: Management of dust and emissions to air

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

Project component/s	<ul style="list-style-type: none"> » PV facility. » Access roads. » Associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » Dust generation and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and construction equipment.
Activity/risk source	<ul style="list-style-type: none"> » Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling and associated construction activities. » Transport of materials, equipment, and components on internal access roads and the associated increased traffic. » Vehicle movement on gravel roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase.

- » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase.
- » Suppression of dust, pollution control and minimise dust generation.

Mitigation: Action/control	Responsibility	Timeframe
Implement appropriate dust suppression measures on a regular basis along the access road and on the proposed site.	Contractor	Construction
Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Construction
Areas to be cleared in a progressive manner. Road surfaces and other infrastructure to be constructed as soon as possible after vegetation clearing in order to minimise exposed ground surfaces, specifically roads which carry traffic.	Contractor	Construction
Roads must be maintained to a manner that will ensure that nuisance to the community from dust emissions from road or vehicle sources is not visibly excessive.	Contractor	Construction
Appropriate dust suppressant must be applied on all gravel roads associated, exposed areas and stockpiles associated to the project as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered with suitable material tarpaulins shade cloth.	Contractor	Duration of contract
Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Contractor	Duration of contract
Speed of construction vehicles must be restricted to 40km/hr on all roads within the site.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
All vehicles and containers used for moving waste must encapsulate the waste, which prevents the waste from causing odours and from escaping or blowing around the site. This will also prevent leachate material from spilling out of the containers, which is hazardous.	Contractor	Duration of contract
Should a batching plant be required, this must be enclosed with shade cloth to reduce the amount of cement particulates/ particles released into the environment.	Contractor	Duration of contract

Performance Indicator

- » No complaints from affected residents or community regarding dust or vehicle emissions.
- » Visual presence of dust and air quality.
- » Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility).

	<ul style="list-style-type: none"> » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis. » A complaints register must be maintained, in which any complaints from neighbouring farmers will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon.
Monitoring	<p>Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident register and non-conformance must be used to record incidents and non-conformances to the EMPr. » A complaints register must be used to record grievances by the public.

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

Project Component/s	<ul style="list-style-type: none"> » Delivery of any component required for the construction phase of the facility.
Potential Impact	<ul style="list-style-type: none"> » Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix concrete to the site. » Mobile construction equipment movement on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise impact of traffic associated with the construction of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction. » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.

Mitigation: Action/Control	Responsibility	Timeframe
Adequate traffic accommodation signage must be erected and maintained on either side of the access, on the trafficked routes, throughout the construction period	Contractor	Pre-construction
Undertake regular maintenance of gravel roads by the Contractor during the construction phase.	Contractor	Construction
Implement penalties for reckless driving as a way to enforce compliance to traffic rules.	Contractor	Construction
The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged (i.e. wear and tear) due to construction activities.	Developer Contractor	Construction
Should abnormal loads have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government. Alert traffic authorities well in advance of any heavy loads that will be transported on local roads and elicit their assistance in controlling traffic associated with the transportation of these loads.	Contractor appointed transportation contractor)	(or Pre-construction
Ensure that, at all times, people have access to their properties as well as to social facilities.	Developer Contractor	Construction
Limit the need for transportation over long distances by sourcing as much materials and goods as is feasible from local suppliers.	Contractor	Construction
Heavy vehicles used for construction purposes should be inspected regularly to ensure their road-worthiness.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor	Construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Construction
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor appointed transportation contractor)	(or Construction
Heavy construction vehicles should be restricted to off-peak periods. Schedule the delivery hours to avoid peak hour traffic, weekends and evenings and stagger component delivery to site.	Contractor	Construction
Staff and general trips to the site should occur outside of peak traffic periods.	Contractor	Construction
Any traffic delays expected because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Construction
When upgrading, constructing and maintaining the access road ensure that proper hazard warnings signage and traffic control mechanisms such as flags men and traffic control barriers, chevrons and traffic cones separating the road from the worksite are in place at all times	Contractor	Construction
Visible signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards). Signage must be appropriately maintained throughout the construction period.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Construction
All construction vehicles must remain on properly demarcated roads. No off-road driving to be allowed.	Contractor	Construction
The contractors must ensure that there is a dedicated access and an access control point to the site.	Contractor	Construction
Provide clearly defined roadway, parking and pedestrian walkway areas within the site with adequate lighting	Contractor	Construction
Partner with local municipalities and other prominent users of the local roads to upgrade them to meet the required capacity and intensity of the vehicles related to the planned construction activities.	Contractor	Construction
Provide public transportation service for workers in order to reduce congestion on roads.	Contractor	Construction
All construction vehicles must be road worthy.	Contractor	Construction
All construction vehicle drivers must have the relevant licenses of the use of the vehicles and need to strictly adhere to the rules of the road.	Contractor	Construction
Heavy construction vehicles should be restricted to off-peak periods.	Contractor	Construction
Abnormal load vehicles require specific permit for transporting loads, and require liaison with relevant road authorities to ensure route suitability.	Contractor	Construction

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

OBJECTIVE 13: Appropriate handling and management of waste

The construction of the PV1 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)

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

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties, and that the waste is disposed of at dumping site as approved by the Council.	Contractor	Duration of contract
Waste disposal at the construction site must be avoided by separating and trucking out of waste.	Contractor	Construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste must be removed at least weekly for disposal, if feasible; other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Slips of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
All liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use.	Contractor	Duration of contract
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered landfill site.	Contractor	During and post construction.
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	Contractor	Duration of contract
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Daily inspection of all chemical toilets and septic tanks must be performed by environmental representatives on site.	Contractor	Duration of contract
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste.	Contractor	Duration of construction
Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	Contractor	Duration of construction
Under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor	Duration of construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the materials re-used for an appropriate purpose.	Contractor	Completion of construction
Upon the completion of construction, all sanitation facilities (including chemical toilets) must be removed, as well as the	Contractor	Completion of construction

Mitigation: Action/Control	Responsibility	Timeframe
associated waste to be disposed of at a registered waste disposal site.		
Litter generated by the construction crew must be collected in rubbish bins and disposed of weekly, or at an appropriate frequency, at registered waste disposal sites.	Contractor	Duration of construction
All building rubble, solid and liquid waste etc. generated during the construction activities must be disposed of as necessary at an appropriately licensed refuse facility.	Contractor	Duration of construction
Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires will be allowed on site.	Contractor	Duration of construction
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project and that the waste is disposed of at dumping site as approved by the Council.	Contractor	Duration of construction

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » Proof of disposal of sewage at an appropriate wastewater treatment works. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 14: Appropriate handling and storage of chemicals and/or hazardous substances

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

Project Component/s	<ul style="list-style-type: none"> » Laydown areas. » Temporary hydrocarbon and chemical storage areas.
Potential Impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers. » Soil pollution.

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

Mitigation: Action/Control	Responsibility	Timeframe
Implement an emergency preparedness plan during the construction phase.	Contractor	Duration of Contract
Any liquids stored on site, including fuels and lubricants, should be stored in accordance with applicable legislation.	Contractor	Duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard standing.	Contractor	Construction
Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to: <ul style="list-style-type: none"> » Designated area; » All applicable safety signage; » Firefighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents. 	Contractor	Duration of Contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required, a NEMA Section 30 report must be submitted to DFFE within 14 days of the incident.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. Check	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
vehicles and machinery daily for oil, fuel and hydraulic fluid leaks and undertake regular high standard maintenance on vehicles.		
Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within an appropriate bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1 and any relevant by-laws.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	Contractor	Construction
As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site.	Contractor	Construction
All chemicals and toxicants used during construction must be stored in bunded areas.	Contractor	Construction
All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site (pre-use inspection).	Contractor	Construction
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	Contractor	Construction
Have appropriate action plans on site, and training for contractors and employees in the event of spills, leaks and other	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
potential impacts to the aquatic systems. All waste generated on-site during construction must be adequately managed.		
Should a chemical spill take place, an aquatic ecologist must be contracted to identify the extent of the impact and assist with additional mitigation measures.	Contractor	Construction
Minimise fuels and chemicals stored on site.	Contractor	Construction
Install bunds on storage areas and take other precautions to reduce the risk of spills.	Contractor	Construction
Implement a contingency plan to handle spills, so that environmental damage is avoided.	Contractor	Construction
No refuelling, servicing of plant/equipment or chemical substance storage allowed outside of designated areas.	Contractor	Construction
Drip trays should be used during all fuel/chemical dispensing.	Contractor	Construction
Drip trays to be placed beneath standing machinery/plant.	Contractor	Construction
In the case of petrochemical spillages, the spill should be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).	Contractor	Construction
Implement a regional (industrial area-wide) emergency response plan with involvement by the local authorities as well as alarms and communication systems which allow for fast and effective communication to neighbouring facilities. The area around the site is sparsely populated, so any impact would not be experienced by a large number of people.	Contractor	Construction

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

OBJECTIVE 15: Effective management of concrete batching plant

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

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

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

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

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

6.3 Detailing Method Statements

OBJECTIVE 16: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

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

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

- » Responsible person/s;
- » Construction procedures;
- » Materials and equipment to be used;

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

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

- » Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- » Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure.
- » Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- » Storm water method statement.
- » Ablution facilities (placement, maintenance, management and servicing).
- » Solid Waste Management:
 - * Description of the waste storage facilities (on site and accumulative).
 - * Placement of waste stored (on site and accumulative).
 - * Management and collection of waste process.
 - * Recycle, re-use and removal process and procedure.
- » Liquid waste management.
- » Design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into the surrounding environment. Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure no seepage into the surrounding environment occurs.
- » Dust and noise pollution:
 - * Describe the necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
 - * Procedure to control dust at all times on the site, access roads and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- » Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
 - * Lists of all potentially hazardous substances to be used.
 - * Appropriate handling, storage and disposal procedures.

- * Prevention protocol of accidental contamination of soil at storage and handling areas.
- * All storage areas, (i.e. for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
 - * Rehabilitation, re-vegetation process and bush clearing.
- » Incident and accident reporting protocol.
- » General administration.
- » Designate access road and the protocols while roads are in use.
- » Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager (with input from the ECO), except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

6.4 Awareness and Competence: Construction Phase

OBJECTIVE 17: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

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

The Contractors obligations in this regard include the following:

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

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

6.4.1 Environmental Awareness and Induction Training

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

As a minimum, induction training should include:

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

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

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

6.4.2 Toolbox Talks

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

6.5 Monitoring Programme: Construction Phase

OBJECTIVE 18: To monitor the performance of the control strategies employed against environmental objectives and standards

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

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

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

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

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

6.5.1. Non-Conformance Reports

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

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

6.5.2. Monitoring Reports

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

6.5.3. Audit Reports

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

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

6.5.4. Final Audit Report

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

CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION

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

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

7.1. Objectives

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

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Implement an appropriate Revegetation and Rehabilitation Plan.	Contractor	Following execution of the works
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
Laydown areas and construction camps are to be checked for spills of substances such as oil, paint, etc. Any spills recorded must be cleaned up and the contaminated soil appropriately disposed of.	Contractor	Following completion of construction activities in an area

Mitigation: Action/Control	Responsibility	Timeframe
All voids must be backfilled. Any gullies or dongas must also be backfilled.	Contractor	Following completion of construction activities in an area
Where disturbed areas are not to be used during the operation of the PV facility, these areas must be rehabilitated/re-vegetated with appropriate natural indigenous vegetation and/or local seed mix. A seed mix must be applied to rehabilitated and bare areas. No exotic plants must be used for rehabilitation purposes. No grazing must be permitted to allow for the recovery of the area.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
The area must be shaped to a natural topography. Trees (or vegetation stands) removed must be replaced.	Contractor	Following completion of construction activities in an area
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor	Following completion of construction activities in an area
Compacted areas must be ripped (perpendicularly) to a depth of 300mm, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked. The temporary access roads must be rehabilitated.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation. Soils must be replaced in the correct sequence / profile.	Contractor	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Contractor in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage systems if necessary.	Contractor in consultation with EO and rehabilitation specialist (if required)	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Contractor	Post-rehabilitation

Performance Indicator	<ul style="list-style-type: none"> » All portions of the site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas.
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	<ul style="list-style-type: none">» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites.» Completed site free of erosion and alien invasive plants.
Monitoring	<ul style="list-style-type: none">» Rehabilitated areas should be monitored (responsibility of EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has rehabilitated to a satisfactory level.» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility.» On-going alien plant monitoring and removal should be undertaken on an annual basis.

CHAPTER 8: OPERATION MANAGEMENT PROGRAMME

Overall Goal: To ensure that the operation of the PV1 does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

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

8.1. Objectives

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

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

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

The **Power Station Manager** will:

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

The **Technical/SHEQ Manager** will:

- » Develop and Implement an Environmental Management System (EMS) for the PV facility and associated infrastructure.
- » Manage and report on the facility's environmental performance.
- » Maintain a register of all known environmental impacts and manage the monitoring thereof.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as the National and Provincial Department of Environment Forestry and Fisheries (DFFE) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.
- » Track and control the lodging of any complaints regarding environmental matters.

OBJECTIVE 2: Limit the ecological footprint of the PV Plant

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.		
If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.	Developer	Operation
Maintenance of the perimeter fencing must ensure that it minimises impacts on species susceptible to entrapment.	Developer	Operation
Vehicle movements must be restricted to designated access roads.	Developer	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Developer	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (bags, logs), silt fences, storm water catch-pits, and shade nets).	Developer	Operation
Develop and implement an appropriate stormwater management plan for the operation phase of the facility.	Developer	Operation
Site access should be controlled and only authorised staff and contractors should be allowed on-site.	Developer	Operation
No harvesting of plants for firewood, medicinal or any other purposes are to be permitted	Developer	Operation
No killing and poaching of any wild animal to be allowed. This should be clearly communicated to all employees, including subcontractors.	Developer	Operation
Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities must be removed to a safe location.	Developer	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Developer	Operation
Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified.	Developer	Operation

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

OBJECTIVE 3: Avifauna Impacts

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

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

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

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

OBJECTIVE 4: Erosion Management

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

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

	» Sedimentation of water resources
Activity/Risk Source	» Stormwater runoff from panels and roads. » Runoff of wash water during cleaning of panels
Mitigation: Target/Objective	» Implement appropriate erosion control measures to minimise risk of erosion.

Mitigation: Action/Control	Responsibility	Timeframe
Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.	O&M Operator	Operation phase
Ensure rain gauge is installed that can measure greater than 150ml	O&M Operator	Operational phase
Record rain data: Read and record rain gauge daily;	O&M Operator	Operational phase
All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.	O&M Operator	Operation phase
It may be necessary to construct ponds in some areas to capture and process runoff from the site. If this is necessary, this should take place in consultation with a freshwater specialist. Any ponds constructed should not be lined with smooth plastic as fauna tend to fall into such ponds and are unable to escape due to the slippery sides of the pond.	O&M Operator	Operation phase
Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance must be undertaken, as per the Erosion Management and Rehabilitation Plans for the project.	O&M Operator	Operation phase
All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	O&M Operator	Operation phase
All cleared areas must be revegetated with indigenous perennial shrubs and succulents from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	O&M Operator	Operation phase

Performance Indicator	» No erosion problems resulting from operational activities within the PV facility.
Monitoring	» Regular inspections to monitor erosion within the site and along access roads.

OBJECTIVE 5: Minimise the establishment and spread of alien invasive plants

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

- » Loss of indigenous vegetation;
- » Change in vegetation structure leading to change in various habitat characteristics;
- » Change in plant species composition;
- » Change in soil chemical properties;

- » Loss of sensitive habitats;
- » Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
- » Fragmentation of sensitive habitats;
- » Change in flammability of vegetation, depending on alien species; and
- » Hydrological impacts due to increased transpiration and runoff.

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

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an IAP Control and Eradication Programme.	Developer	Operation
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants. 	Developer	Operation
Annual monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan to be developed for the site. When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.	Developer	Operation
Eradicate all weeds and alien invasive plants as far as practically possible and ensure that material from invasive plants are adequately destroyed and not further distributed.	Developer	Operation
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species	Developer	Operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
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.		

Performance Indicator	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
Monitoring	<ul style="list-style-type: none"> » On-going monitoring of area by EO during construction. » Annual audit of development footprint and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site. » The environmental manager/site agent should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 6: Minimise dust and emissions to air

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

Project Component/s	<ul style="list-style-type: none"> » Gravel roads and surfaces. » On-site vehicle movement.
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles.
Activities/Risk Sources	<ul style="list-style-type: none"> » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements. » To ensure emissions from the power generation process are minimised.

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

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

OBJECTIVE 7: Ensure the implementation of an appropriate fire management plan and general management measures during the operation phase

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

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

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

Project Component/s	<ul style="list-style-type: none"> » PV Array and BESS. » Associated buildings
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the PV facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate firefighting equipment on site and establish a fire-fighting management plan during operation.	O&M Contractor	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Contractor	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Contractor	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Contractor	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Contractor	Operation
Road borders must be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.	O&M Contractor	Operation
Should panels be required to be replaced, the following will apply: <ul style="list-style-type: none"> » Materials and panels are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur. » Full clean-up of all materials must be undertaken after the removal and replacement of the solar panel arrays and associated infrastructure is complete, and disturbed areas appropriately rehabilitated. » Most of the materials used for solar panel systems can be recycled. The majority of the glass and semiconductor materials can be recovered and re-used or recycled. Recyclable materials must be transported off-site by truck and managed at appropriate facilities in accordance with relevant waste management regulations. No waste materials may be left on-site. » Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation. 	O&M Contractor	Operation

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

OBJECTIVE 8: Maximise local employment, skills development and business opportunities associated with the construction phase

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

Activities/Risk Sources	<ul style="list-style-type: none"> » Limited use of local labour, thereby reducing the employment and business opportunities for locals. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area. » Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Higher skilled positions might be sourced internationally, where required.
Enhancement: Target/Objective	<ul style="list-style-type: none"> » The Developer should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors. » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building.

Mitigation: Action/Control	Responsibility	Timeframe
Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	Developer	Operation
In order to maximise the positive impact, it is suggested that the Developer provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience.	Developer	Operation
Facilitate the transfer of knowledge between experienced employees and the staff.	Developer	Operation
Perform a skills audit to determine the potential skills that could be sourced in the area.	Developer	Operation
Effort should be made to use locally sourced inputs where feasible in order to maximize the benefit to the local economy. Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the construction of the facility, as far as feasible.	Developer	Operation
Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible	Developer	Operation

Performance Indicator	<ul style="list-style-type: none"> » Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities regarding unrealistic employment opportunities or that only outsiders were employed. » Employment and business policy document that sets out local employment and targets is completed before the construction phase commences. » Skills training and capacity building initiatives are developed and implemented.
Monitoring	<ul style="list-style-type: none"> » Developer must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes.

OBJECTIVE 9: Minimise impacts related to traffic management

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

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that, at all times, people have access to their properties as well as to social facilities.	Developer	Operation
Vehicles used for operation and maintenance purposes should be inspected regularly to ensure their road-worthiness.	Developer	Operation
Strict vehicle safety standards should be implemented and monitored.	Developer	Operation
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Developer	Operation
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Developer	Operation
Provide clearly defined roadway, parking and pedestrian walkway areas within the site with adequate lighting	Developer	Operation
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Developer	Operation
Provide clearly defined roadway, parking and pedestrian walkway areas with adequate lighting.	Developer	Operation
Staff and general trips to the site should occur outside of peak traffic periods.	O&M Contractor	Operation

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

OBJECTIVE 10: Appropriate handling and management of hazardous substances, waste and dangerous goods

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, etc.) must be stored in sealed containers within a clearly demarcated designated area.	Developer	Operation
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Developer	Operation and maintenance
Storage areas for hazardous substances must be appropriately sealed and bunded.	Developer	Operation
Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.	Developer	Operation
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	Developer	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Developer	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Developer	Operation and maintenance

Mitigation: Action/Control	Responsibility	Timeframe
All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.	Developer	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Developer	Operation
All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Developer	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	Developer	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Developer	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Developer	Operation
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	Developer	Operation
Separation and recycling of different waste materials should be supported.	Developer	Operation
Should a chemical spill take place, an aquatic ecologist must be contracted to identify the extent of the impact and assist with additional mitigation measures.	Developer	Operation
Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.	Developer	Operation
Regular quality monitoring of waste before discharge.	Developer	Operation
The dirty water dam will need to be lined to prevent any seepage of waste water.	Developer	Operation
Emergency response arrangements and systems such as foam pourers, fire-fighting systems and cooperation with emergency responders. Preventive measures could include maintenance procedures to prevent the occurrence of a catastrophic loss of containment, as well as strict control of ignition sources and other measures which may be required according to standards such as those prescribed by the South African National Standards system.	Developer	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon.

- » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the O&M operator.
- » All appropriate waste disposal certificates accompany the monthly reports.

OBJECTIVE 11: Appropriate operation and maintenance of Battery Energy Storage System

Project Component/s	» Integrated Energy Storage System
Potential Impact	» Fire and safety risks » Leakages and impacts on soils and water resources
Activities/Risk Sources	» Inappropriate operation and maintenance of BESS
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of associated with the operation and maintenance of the BESS.

Mitigation: Action/Control	Responsibility	Timeframe
Compile a procedure for the safe handling of battery cells	O&M Contractor/ Project Company	Operation
Ensure that battery supplier user guides, safety specifications and MSDS are filed on site at all times.	O&M Contractor / Project Company	Operation
Operate, maintain and monitor the BESS as per supplier specifications.	O&M Contractor / Project Company	Operation
Compile method statements for approval by the Technical/SHEQ Manager for battery cell, electrolyte and battery cell/ container replacement. Maintain method statements on site.	O&M Contractor / Project Company	Operation
Ensure that all maintenance contractors/ staff are familiar with the supplier's specifications.	O&M Contractor / Project Company	Operation
Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock.	O&M Contractor / Project Company	Operation
Provide signage on site specifying how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. toxic fumes).	O&M Contractor / Project Company	Operation
Maintain suitable firefighting equipment on site.	O&M Contractor / Project Company	Operation
Maintain strict access control to the battery storage area.	O&M Contractor / Project Company	Operation
Undertake regular visual checks on BESS equipment to identify signs of damage or leaks.	O&M Contractor / Project Company	Operation
Provide environmental awareness training to all personnel on site. Training should include discussion of: <ul style="list-style-type: none"> • Potential impact of electrolyte spills on groundwater; • Suitable disposal of waste and effluent; • Key measures in the EMPr relevant to worker's activities; • How incidents and suggestions for improvement can be reported. 	O&M Contractor / Project Company	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.		
Performance Indicator	<ul style="list-style-type: none"> » 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. 	
Monitoring	<ul style="list-style-type: none"> » The O&M contractor/ Project Company must monitor indicators listed above to ensure that they have been met. 	

CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING

The lifespan of the proposed PV1 will be more than 25 years. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. The lifespan of the PV1 could be extended depending on the condition of the infrastructure. An assessment will be undertaken prior to the end of the lifecycle of the plant to determine whether the plant should be decommissioned or whether the operation of the plant should continue.

It is most likely that decommissioning activities of the infrastructure of the facility discussed in the EIA process would comprise the disassembly, removal and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of waste from the site and rehabilitation to the desired end-use. Future use of the site after decommissioning of the PV1 could possibly form part of an alternative industry that would be able to utilise some of the existing infrastructure associated with the facility. This would however be dependent on the development plans of the area at the time.

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

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

9.1. Objectives

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

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

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

9.2. Approach to the Decommissioning Phase

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

Two possible scenarios for this decommissioning phase are detailed below:

SCENARIO 1: TOTAL DECOMMISSIONING OF PV FACILITY

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

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

SCENARIO 2: PARTIAL DECOMMISSIONING OF ENERGY FACILITY

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

9.2.1. Identification of structures for post-closure use

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

9.2.2. Removal of infrastructure

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

9.2.3. Soil rehabilitation

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

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

9.2.4. Establishment of vegetation

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

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

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

9.2.5. Maintenance

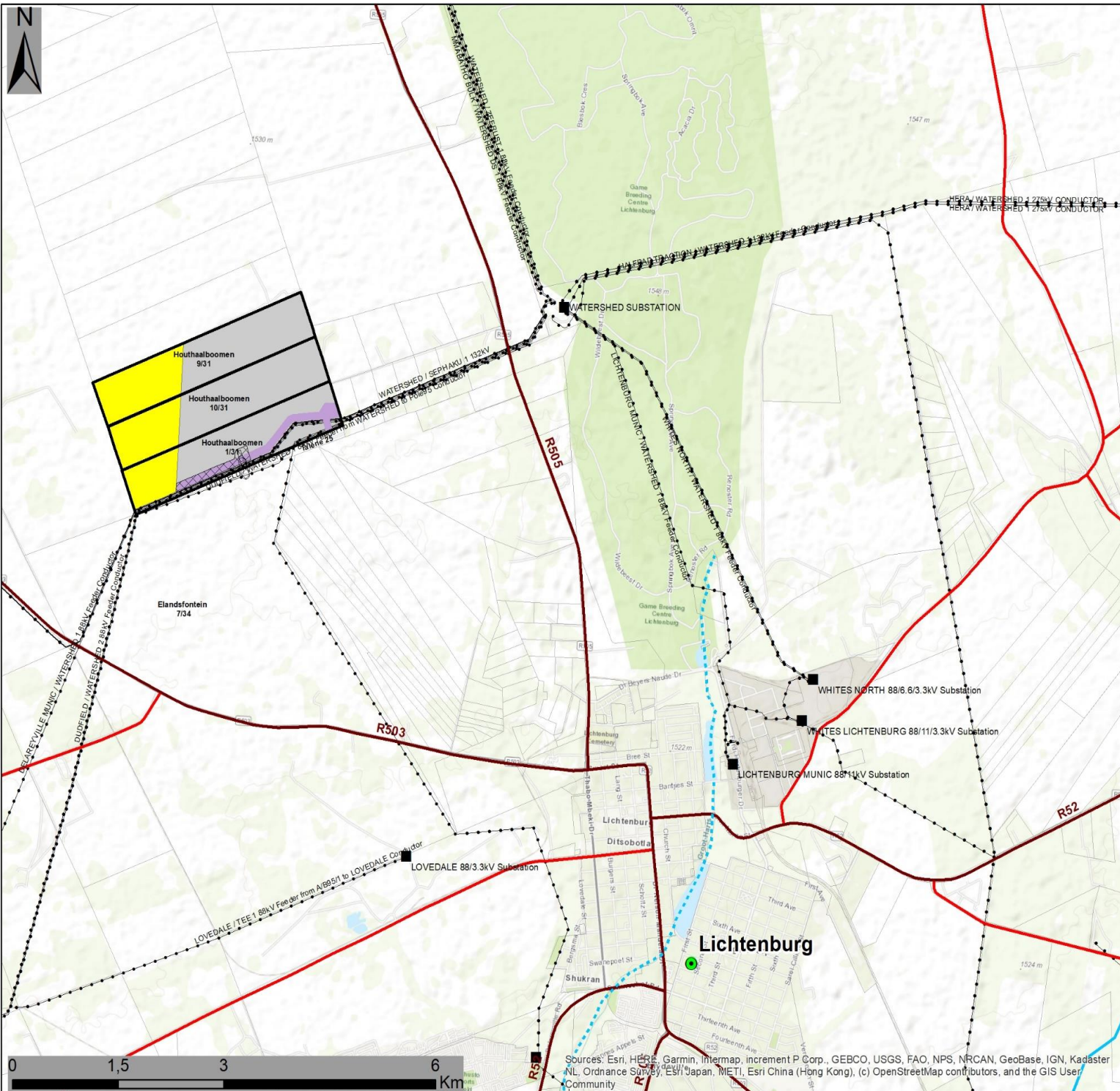
Established vegetation requires regular maintenance. If the growth medium consists of low-fertility soils, then regular maintenance will be required until the natural fertility cycle has been restored.

9.2.6. Monitoring

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

The following items should be monitored continuously:

- » Erosion status;
- » Vegetation species diversity; and
- » Faunal re-colonisation.



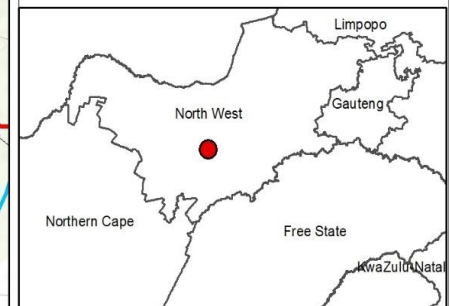
Barleria PV Facility and Associated Infrastructure, North West Province

Locality Map

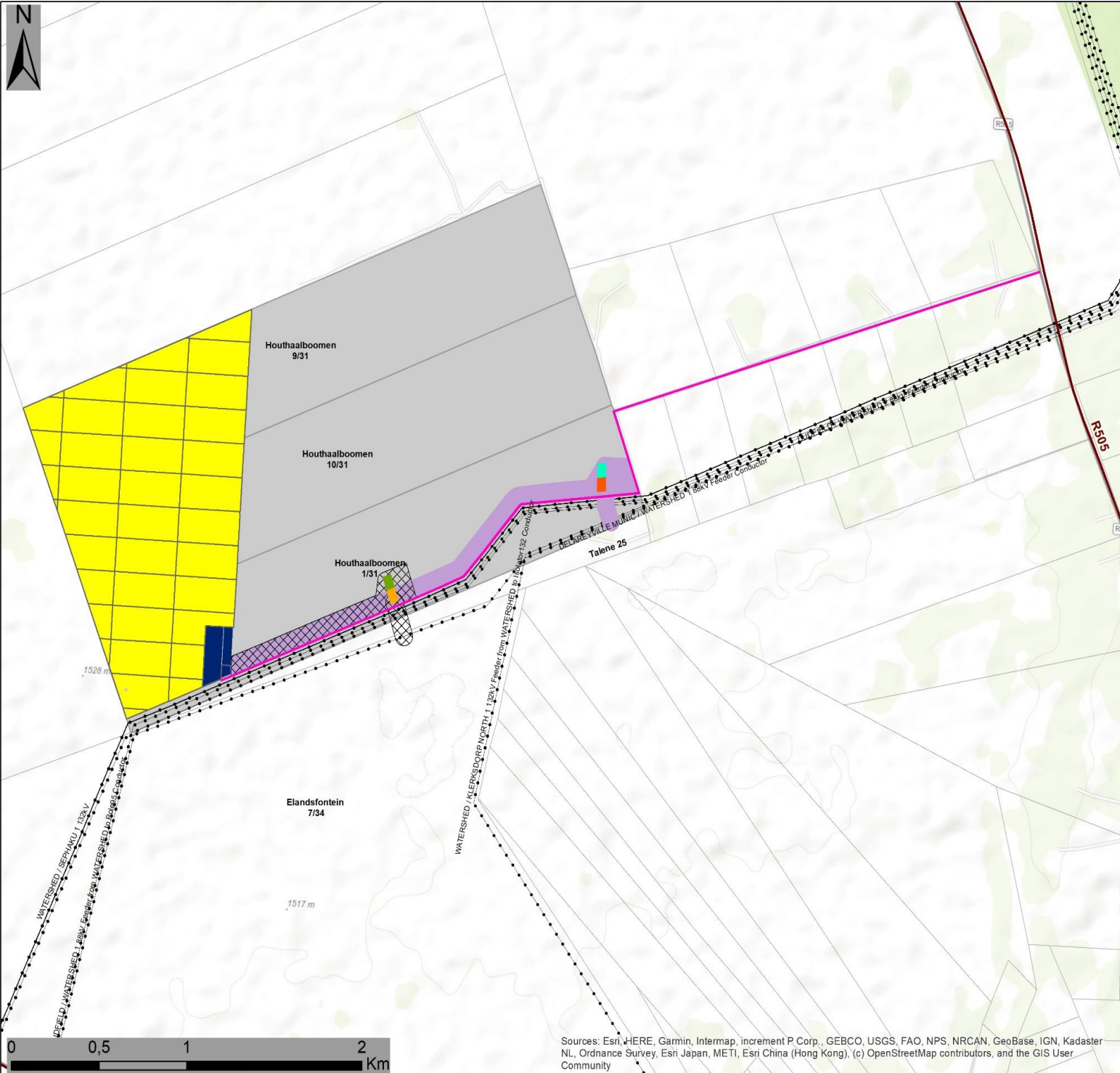
Legend

- Town
- Eskom Substation
- Existing Power Lines
- Non-Perennial River
- Perennial River
- National Route
- Regional Road
- Main Road
- Farm Portions
- Affected Property
- Barleria PV Development Area
- Grid Connection Corridor Alternative 1 (100m wide)
- Grid Connection Corridor Alternative 2 (100m wide)

Scale: 50 000
 Projection: LO19
 Map Ref: Barleria Locality Map



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



Barleria PV Facility and Associated Infrastructure, North West Province

Layout Map

Legend

- Town
- Eskom Substation
- Regional Road
- Main Road
- Existing Power Lines
- Affected Property
- Farm Portions

Facility Layout:

- Internal Road
- Existing Access Road - Provincial Road D2435 (to be upgraded)
- BESS, Construction and O&M hub
- PV Array

Grid Connection Corridor Alternative 1:

- Grid Connection Corridor (100m)
- Eskom Switching Station
- Facility Substation

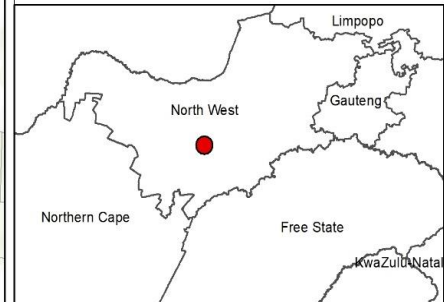
Grid Connection Corridor Alternative 2:

- Grid Connection Corridor (100m)
- Eskom Switching Station
- Facility Substation

Scale: 20 000
 Projection: LO19
 Map Ref: Barleria Layout Map



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community





Barleria PV Facility and Associated Infrastructure, North West Province

Facility Layout & Sensitivity Map

Legend

- Regional Road
- Existing Power Lines
- Affected Property
- Farm Portions

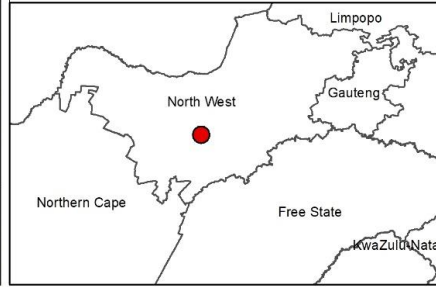
Layout:

- Internal Road
- Existing Access Road - Provincial Road D2435 (to be upgraded)
- BESS, Construction and O&M hub
- PV Array
- Grid Connection Corridor Alternative 1:**
 - Grid Connection Corridor (100m)
 - Eskom Switching Station
 - Facility Substation
- Grid Connection Corridor Alternative 2:**
 - Grid Connection Corridor (100m)
 - Eskom Switching Station
 - Facility Substation

Environmental Sensitivities:

- Heritage Feature - Potential Burial Site (10m buffer)
- Avifauna (Medium)
- Ecological Sensitivity (Medium)
- Ecological Sensitivity (Low Medium)

Scale: 20 000
 Projection: LO19
 Map Ref: Barleria Layout & Sens


















Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri, Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



Barleria PV Facility and Associated Infrastructure, North West Province

Preferred Facility Layout & Sensitivity Map

Legend

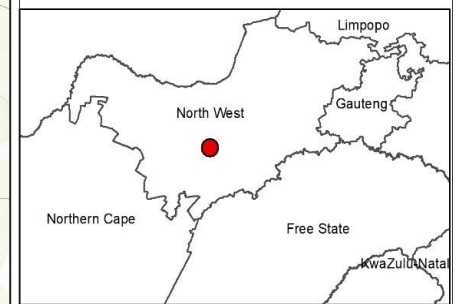
-  Regional Road
 -  Existing Power Lines
 -  Affected Property
 -  Farm Portions
- Layout:**
-  Internal Road
 -  Existing Access Road - Provincial Road D2435 (to be upgraded)
 -  BESS, Construction and O&M hub
 -  PV Array
- Grid Connection Corridor Alternative 1:**
-  Grid Connection Corridor (100m)
 -  Eskom Switching Station
 -  Facility Substation
- Environmental Sensitivities:**
-  Heritage Feature - Potential Burial Site (10m buffer)
 -  Avifauna (Medium)
 -  Ecological Sensitivity (Medium)
 -  Ecological Sensitivity (Low Medium)

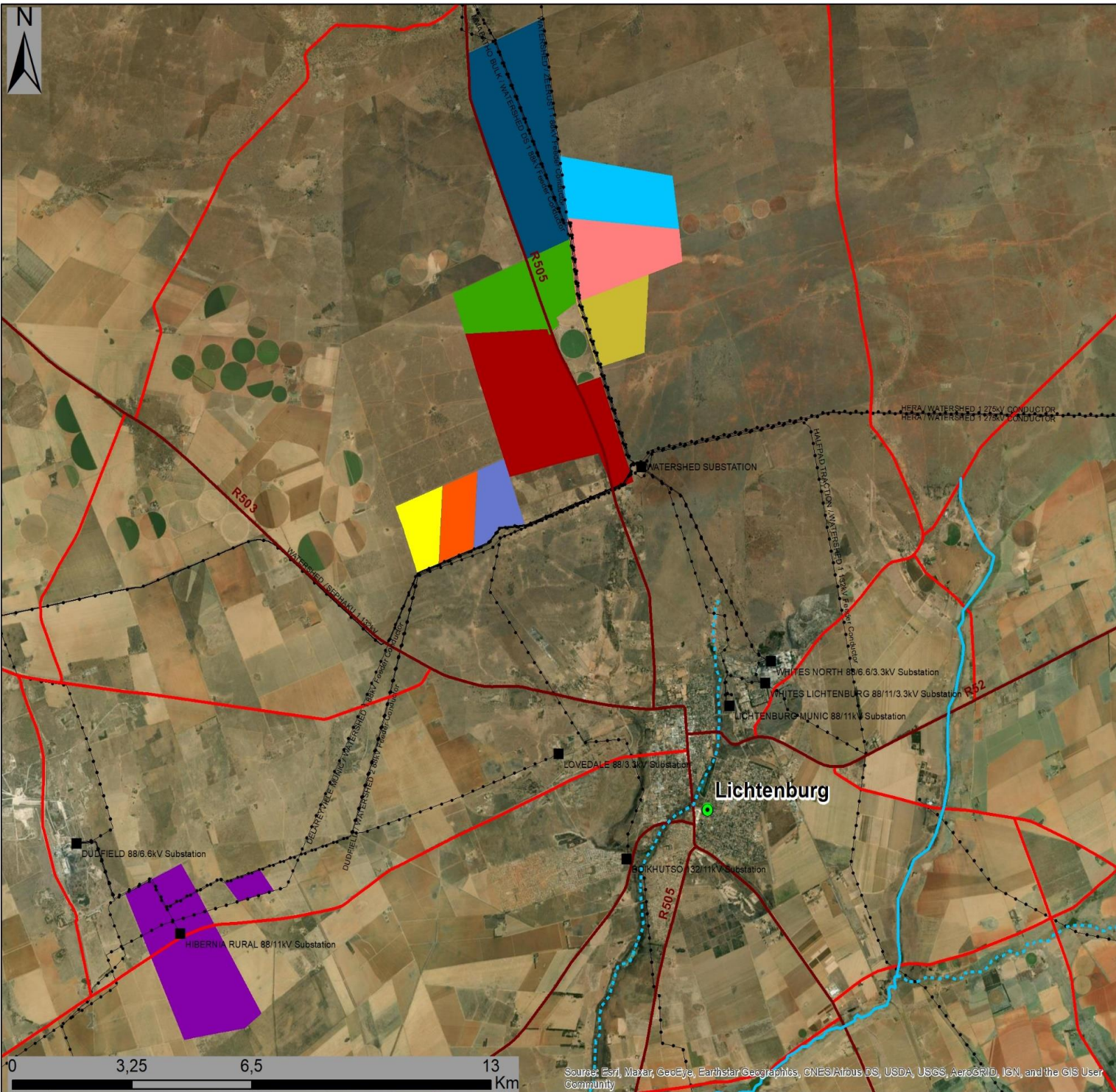


Scale: 20 000
 Projection: LO19
 Map Ref: Barleria Pref Layout & Sens



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community





Barleria PV Facility and Associated Infrastructure, North West Province

Cumulative Map

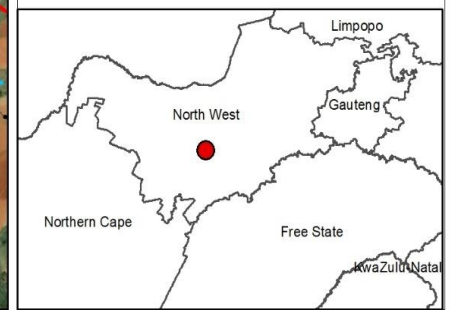
Legend

- Town
- Eskom Substation
- Existing Power Lines
- Non-Perennial River
- Perennial River
- National Route
- Regional Road
- Main Road
- Barleria PV Facility

Other known solar PV facilities:

- Setaria PV Facility (in process)
- Dicoma PV Facility (in process)
- Hibernia PV Facility (authorised)
- Tiisitseng PV Cluster (authorised)
- Lichtenburg 3 PV Facility (authorised)
- Lichtenburg 2 PV Facility (authorised)
- Lichtenburg 1 PV Facility (authorised)
- Lichtenburg Solar Park (authorised)
- Subsolar PV Cluster (in process)

Scale: 50 000
 Projection: LO19
 Map Ref: Barleria Locality Map



Sources: Esri, Maxar, GeoEye, Earthstar/Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Barleria PV Facility, North West Province – Coordinates

Site	Coordinates	Latitude:	Longitude:
(development area)	Northern point	26° 5'58.28"S	26° 5'6.50"E
	Eastern point	26° 6'27.74"S	26° 5'28.32"E
	Southern point	26° 6'56.48"S	26° 5'19.36"E
	Western point	26° 6'36.63"S	26° 4'56.50"E
	Centre point	26° 6'25.20"S;	26° 5'10.14"E

Coordinates of Grid Connection Alternatives	Grid Corridor	Grid Connection Corridor Alternative 1	Grid Connection Corridor Alternative 2
		Start: 26° 6'51.22"S 26° 5'28.66"E	Start: 26° 6'51.12"S 26° 5'28.61"E
		Middle: 26° 6'31.07"S 26° 6'13.55"E	Middle: 26° 6'43.87"S 26° 5'46.82"E
		End: 26° 6'14.28"S 26° 6'47.93"E	End: 26° 6'35.36"S 26° 6'3.73"E

Centre Coordinates BESS, Construction and O&M hub	26° 6'36.63"S	26° 4'56.50"E
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GRIEVANCE MECHANISM / PROCESS

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 are raised by stakeholders and to ensure such grievances 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 address grievances in a manner that does not require a potentially costly and time-consuming legal process.

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:

- » 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 in order for grievances to be addressed. 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 the nominated contact person. 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); and
 - 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 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 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.

The grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the Developer, either party may be entitled to legal action if an appropriate option, however, this grievance mechanisms aims to avoid such interactions by addressing the grievances within a short timeframe, and to mutual satisfaction, where possible.

ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

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 Sun Garden PV Facility and the associated infrastructure. 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 life-cycle of the PV facility, 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.

2. LEGISLATIVE CONTEXT

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), 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 (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEM:BA. The most recent updates to the NEM:BA AIS Regulations were gazetted on 25 September 2020 (in force from 1 March 2021) and in the updated AIS list was gazetted 18 September 2020 (in force 1 March 2021). 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 Conservation of Agricultural Resources Act (Act 43 of 1983) (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, time and appropriate and effective control measures. Separate plans or procedures (where applicable) of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The use of chemicals are not recommended for any wetland areas, unless approved by a qualified wetland specialist. 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 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, and areas with alien saplings 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 won't 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 so 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 additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which 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, product 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) – GNR 1120 of 2010.
- * South African Bureau of Standards, 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, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Forestry, Fisheries and the Environment (DFFE).

» **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 on 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), DFFE can be contacted.

3.4. General management practices

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

- » Establish an on-going 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 regrow, 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, follow-ups and rehabilitation efforts, 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	Preconstruction Monthly during Summer and Autumn 3 Monthly during Winter and Spring

Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document and record alien plant control measures implemented	Record of clearing activities	3 Monthly

Operation Phase

Monitoring Action	Indicator	Timeframe
Document alien plant species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented and 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

PLANT RESCUE AND PROTECTION PLAN

1. PURPOSE

The purpose of the Plant 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 development of the PV facility and associated infrastructure 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 footprint of the development.

The Plan first provides some legislative background on the regulations relevant to listed and protected species, under the National Environmental: Biodiversity Act (Act 10 of 2004), The Nature and Environmental Conservation Ordinance (No. 19 of 1974) and trees protected under the National List of Protected Tree Species (as amended in 2018). This is followed by an identification of protected species present within the development footprint 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 DFFE under the National List of Protected Trees, which is updated on a regular basis. Any clearing of nationally protected trees requires a permit from Department of Agriculture, Land Reform and Rural Development (DALRRD).

Three government notices have been published in terms of Section 56(1) of National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA) as follows:

- » Commencement of TOPS Regulations, 2007 (GNR 150).
- » Lists of critically endangered, vulnerable and protected species (GNR 151).
- » TOPS Regulations (GNR 152).

It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).

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 Nature and Environmental Conservation Ordinance (No. 19 of 1974) are protected and require provincial permits. The Nature and Environmental Conservation Ordinance (No. 19 of 1974) lists a variety of species as protected.

3. IDENTIFICATION OF LISTED SPECIES

There are three listed Red Data species and 16 South African Endemic species that have been recorded within the region. Furthermore, 8 species have been recorded within the area, which is protected under the Transvaal Nature Conservation Ordinance, whilst one tree species has been recorded which is protected under the National Forest Act namely *Vachellia (Acacia) erioloba*.

Table 1: List of floral species that are of conservation concern, and/or protected and which may potentially be found within the development footprint.

Species	STATUS	BODATSA- POSA, 2021	Strohbach, 2013	Likelihood of Occurrence
<i>Nananthus vittatus</i>	DD	X		Low
<i>Cleome conrathii</i>	NT & Endemic	X		Moderate
<i>Brachystelma incanum</i>	VU & Endemic	X		Moderate
<i>Gladiolus elliotii</i>	Protected	X		Low
<i>Gladiolus permeabilis</i>	Protected	X		Moderate
<i>Gladiolus sp.</i>	Protected	X		
<i>Crinum graminicola</i>	Protected	X		Moderate
<i>Crinum macowanii</i>	Protected	X	X	High
<i>Brachystelma foetidum</i>	Protected	X		High
<i>Habenaria epipactidea</i>	Protected	X		Low
<i>Acacia erioloba</i>	Protected	X	X	Confirmed
<i>Schizocarphus nervosus</i>	Protected	X		Confirmed

In terms of the Red Data species recorded within the region; one species is listed as Data Deficient (DD), one species as Near Threatened (NT) and one as Vulnerable (VU).

Based on the SANBI POSA records for the site and surrounding area, a total of three plant Species of Conservation Concern occurs within the area namely *Nananthus vittatus* (Data Deficient), *Cleome conrathii* (Near Threatened) and *Brachystelma incanum* (Vulnerable). Furthermore, a total of nine protected species have been recorded within the area. Ground truthing confirmed no Species of Conservation Concern (SCC) with the affected property whilst three provincially protected species (Transvaal Nature Conservation Ordinance) and one protected tree (National Forest Act) were confirmed to be present on site. All of these species are fairly common within the region and have a fairly wide range within South Africa. *Babiana hypogea* were fairly common within the project area and were recorded frequently within all three vegetation communities. A few *Vachellia erioloba* trees occurred as scattered, individuals.

Also, worth mentioning are species that are not protected or listed as Red Data species but are declining (population decline within South Africa). Such species recorded within the project site include *Boophone disticha*, *Hypoxis hemerocallidea* and *Pelargonium dolomiticum*. Due to their medicinal value, these species are often exposed to illegal collection and trade within the multi-industry. All of these species have a fairly wide distribution range and are regarded as fairly abundant within the Lichtenburg are, and as such it is highly unlikely that the development will have a significant impact on local populations.

Table 2: Protected Plant Species recorded within the affected properties. "TNCO" = Transvaal Nature Conservation Ordinance; "NFA" = National Forest Act.

Species	IUCN Red List	TNCO (Schedule)	NFA	Declining National Populations
<i>Vachellia erioloba</i>	LC		X	X
<i>Gladiolus spp.</i>	LC	7		
<i>Schizocarphus nervosus</i>	LC	7		
<i>Babiana hypogea</i>	LC	7		
<i>Pelargonium dolomiticum</i>	LC			X
<i>Boophone disticha</i>	LC			X
<i>Hypoxis hemerocallidea</i>	LC			X

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 footprint. This defines which and how many individuals of listed and protected species are found within the development footprint. This information is required for the DFFE, Provincial North West Department of Economic Development, Environment Conservation and Tourism (DEDECT) and DALRRD permits (whichever is applicable) which must be obtained before construction can commence.

Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation. Recommendations in this regard would be made following the walk-through of the facility development footprint before construction, where all listed and protected species within the development footprint will be identified and located.

5. RESCUE AND PROTECTION PLAN

5.1. Pre-construction

- » Identification of all listed species which may occur within the site, based on the SANBI POSA database as well as the specialist BA studies for the site and any other relevant literature.
- » Before construction commences at the site, the following actions should be taken:
 - A walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This should happen during the flowering season at the site.
 - 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. The report should also contain a full list of localities where listed species occur within the development footprint 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 SCCs is required from Provincial North West Department of Economic Development, Environment Conservation and Tourism (DEDECT) 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 footprint. Affected individuals should be translocated to a similar habitat outside of the development footprint 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 EO, to ensure that the EO is able to monitor activities appropriately.
- » All cleared material must be handled according to the Revegetation and Rehabilitation Plan and used to encourage the recovery of disturbed areas.
- » EO to monitor vegetation clearing at the site. 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 rehabilitation of already cleared areas should be identified and relocated before general clearing takes place.
- » Any listed species observed within the development footprint that were missed during the pre-construction plant sweeps must 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 ECO must 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 must 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 site should be strictly controlled and all personnel entering or leaving the site must be required to sign in and out with the security officers.
- » The collecting of plants or their parts must be strictly forbidden and signs stating so must be placed at the entrance gates to the site.

6. MONITORING AND 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. This must include a walk-through of all infrastructure including all new access roads, cables, buildings and the substation. The report must 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 DEDECT, DFFE and DALRRD (whichever is applicable). This requires the walk-through report as well as the identification and quantification of all listed and protected species within the development footprint. 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 these permitting authorities as part of the permit conditions. All documentation associated with this process needs to be retained and the final clearing permit must be kept at the site.

- » Active daily monitoring of clearing during construction by the EO to ensure that listed species and sensitive habitats are avoided. All incidents must 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.

Stormwater, Wastewater and Erosion Management Plan for Barleria PV (Pty) Ltd

Barleria PV - SWMP, Lichtenburg, South Africa
Barleria PV



SRK Consulting (South Africa) (Pty) Ltd.

■ 581477/1

■ December 2021

Stormwater, Wastewater and Erosion Management Plan for Barleria PV (Pty) Ltd

Barleria PV - SWMP, Lichtenburg, South Africa

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Picture of the Barleria PV site taken by T.Netshitangani during site visit.

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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Executive Summary

Barleria PV (Pty) Ltd (The Client) propose developing a commercial solar Photo-Voltaic (PV) facility and associated infrastructure on a site located approximately 8 km from Lichtenburg in the North-West Province South Africa.

This report documents the Stormwater, Wastewater and Erosion Management Plan (referred to as the SWMP) required for the proposed development. The SWMP aims to facilitate the protection of surface water resources and covers the total proposed project development area.

The proposed facility has no identifiable surface water resources. All the stormwater impacts that exist can be managed in a practical and cost-effective manner. The moderate to low rainfall and low gradients of the area suggest that the detailed design should not vary significantly from the concepts presented in the report.

Two grid configurations were proposed for the site. The first configuration (Alternative 1) has the MV cabling extending to a new substation ~2.5 km away from the site (see Figure 2). The second configuration (Alternative 2) proposes that the substation is situated north-east of the facility ~1 km away from the site (see Figure 3). Alternative 2 is the preferred layout as there is less disturbance to stormwater, however the difference in stormwater impact between the alternatives is insignificant.

The SWMP was created considering the analysis findings as presented in this report, but should be developed further for detailed design by conducting a detailed topographic survey and developing the stormwater layout on the information available and infrastructure layout. The conceptual designs should be developed to detailed design, and the final plans should incorporate any environmental specifications during construction and operation of the facility.

SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

1 Introduction

SRK Consulting (South Africa) (Pty) Ltd was approached by Barleria PV (Pty) Ltd (the Client) to develop a Stormwater, Wastewater and Erosion Management Plan (referred to as the SWMP) for the proposed new development of a commercial solar Photo-Voltaic (PV) facility. The proposed site is located approximately 8 km from Lichtenburg in the North-West Province of South Africa.

2 Objectives and Scope of Report

2.1 Objectives

The objective of this report is to prepare a SWMP that strives to protect surface water resources, manages erosion risks and to comply with the relevant regulations and guidelines (listed in Section 3.2) for the construction and operation phases of the Barleria PV facility.

2.2 Scope

This report covers the following scope:

- Delineation of the catchments draining through the development area;
- Determination of the type of catchment (clean or dirty area);
- Calculations of peak stormwater discharges from each catchment; and
- Recommendations for stormwater management and erosion protection during the design, construction and operation phases of the proposed project.

The SWMP is a conceptual study at this stage, and a detailed survey and SWMP study will need to be undertaken during the design of the required infrastructure.

The layout of the development area is shown in Figure 1, with other potential PV facilities shown in grey near to the site.

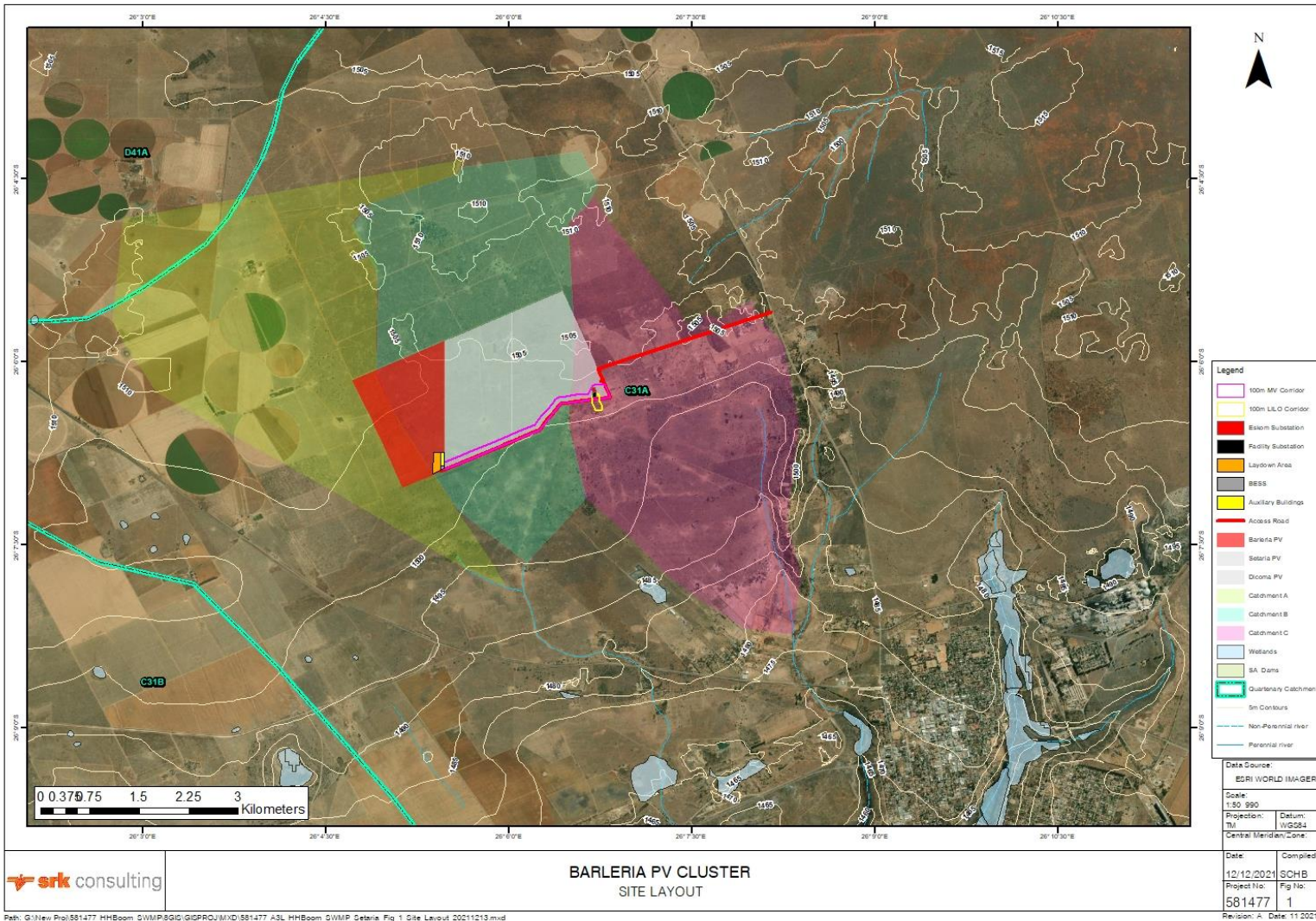


Figure 1: Barleria PV Conceptual Site Layout

3 Supporting Information

This section summarises all of the available information and assumptions upon which the derivation of the SWMP is based. This is done to highlight how the plan was developed: by matching regulations and guidelines to the specific needs of the project in the local natural conditions on site. The available information is therefore key to understanding the SWMP.

3.1 Site and Project Information

The project description was provided by the client and the site information has been informed by a site visit undertaken on 3 November 2021.

3.1.1 Project Information

The following information provided is relevant to stormwater management:

- Fixed-tilt or tracking solar PV panels with a maximum height of 5.5 m;
- Operation and Maintenance (O&M) buildings, inclusive of laydown area, toilet facilities connected to a conservancy tank for wastewater collection, workshop, warehouses and a chemical storage area;
- An electrical substation including transformers containing oil;
- On-site inverters and inverter transformers (containing oil) located between the panels to step up the power;
- Cabling between the project's components, to be laid underground where practical;
- Fencing around the development area;
- A Battery Energy Storage System (BESS). The BESS will be solid state and is therefore a non-liquid/solid-state battery technologies (e.g. Lithium ion)
- Access roads:
 - Existing roads will be used as access roads where possible; and
 - Existing roads will be extended to create access to the Barleria PV facility where necessary.
- During construction, a temporary laydown area will be used;
- Small quantities of fuel and other motor oils will be stored on site and transferred into vehicles. These will be banded.
- The site has one of two proposed grid configurations:
 - Alternative 1 (see Figure 2) – MV cabling extending north-east will connect the facility to the substation (approximately two and a half kilometres from the facility) located as this point;
 - Alternative 2 (see Figure 3) – MV cabling extending north-east will connect the facility to the substation (approximately one kilometre from the facility) located as this point.

General waste will only be stored temporarily and taken off site regularly for disposal to landfill.

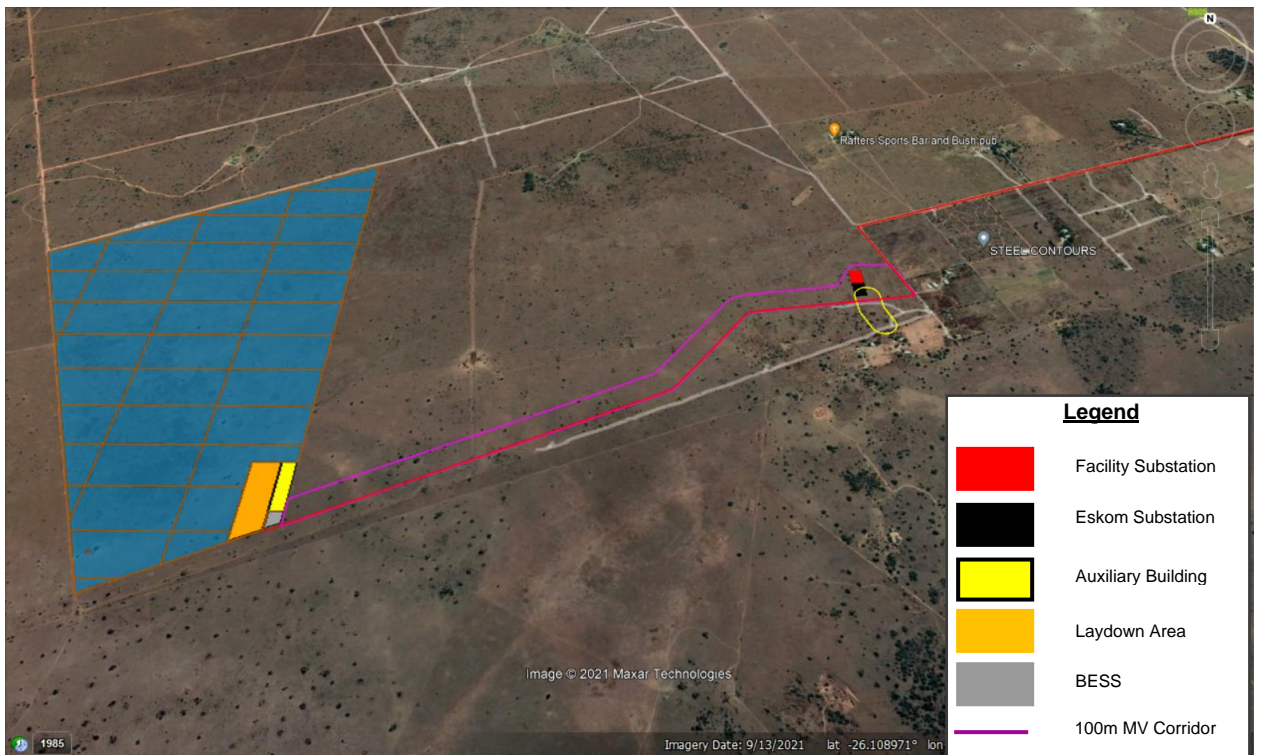


Figure 2: Barleria Grid Configuration (Alternative 1)

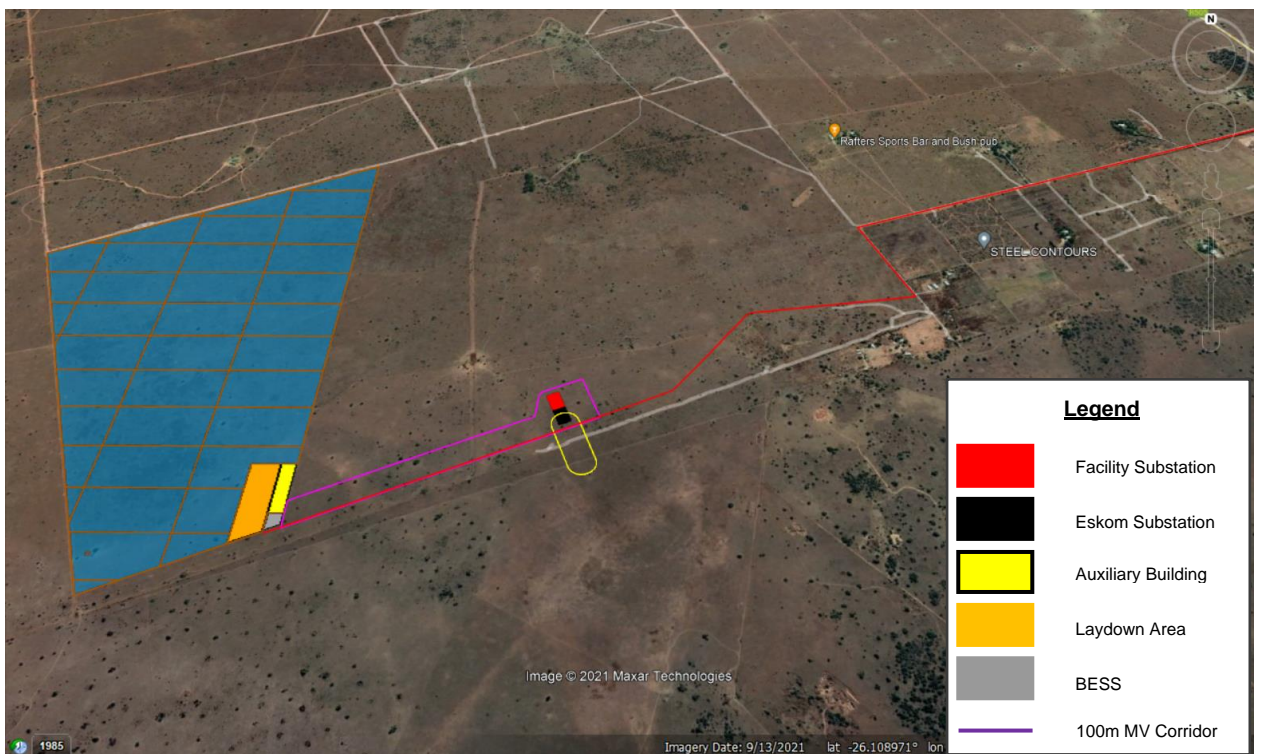


Figure 3: Barleria Grid Configuration (Alternative 2)

3.1.2 Site Visit

The site was visited by T.Netshitangani from SRK Consulting in November 2021. The site terrain is gradual (very “flat” land with low angle slopes in colloquial terms). No erosion was observed in either vegetated areas, cleared areas or near roads.

The soils on the site were assessed visually and judged to have moderate permeability for the purposes of a stormwater management plan. The soils were not lab tested and the judgement erred on the conservative side so that no drains would be undersized. No natural or artificial drainage channels were observed on the site or noted on any maps. The vegetation is composed mainly of medium grass cover with light bush and farmlands on parts of the site. A photograph from the site is shown in Figure 4.



Figure 4: Photograph of the proposed Barleria PV

3.2 Legislation and guidelines

SWMPs are generally required to support the Environmental Management Programme (EMPr) and Water Use License Applications. The following was taken into account in compiling the SWMP:

- Best Practice Guideline for Stormwater Management (Department Water Affairs and Forestry, 2006);
- Regulation 704 of the National Water Act (Department of Water Affairs and Forestry, 4 June 1999).

Municipal regulations, which may introduce specific standards for each municipality, but still adhere to the overall principles of the regulations and guidelines above, should be considered during detailed design (if relevant).

3.3 Natural conditions

3.3.1 Climate

The development lies in an arid to semi-arid climatic region with a mean annual precipitation of 600 mm per year.

3.3.2 Design Rainfall

The rainfall analysis was based on the “Design Rainfall Estimation in South Africa” (DRE) program developed by JC Smithers and RE Schulze (Smithers & Schulze, 2002). The program implements procedures from the Water Research Commission (WRC) project entitled “Rainfall Statistics for Design Flood Estimation in South Africa” (WRC Project K5/1060).

The rainfall data is interpolated for a point within the site from nearby rainfall stations (Smithers and Schulze - Design Rainfall in South Africa). The rainfall station closest to the development area is Lichtenburg (0472281_W), which is approximately 7.6 km from the site. Table 1 indicates the relevant design rainfall for the site.

Table 1: Design Rainfall (mm) Data Interpolated for the site centroid.

Design Rainfall Data (mm) interpolated from the six closest stations							
Mean annual rainfall	596	mm	Latitude	26	degrees	6	minutes
Altitude	1464	mamsl	Longitude	26	degrees	6	minutes
Storm duration	Return Period (Years)						
	2	5	10	20	50	100	200
5 minutes	9.3	12.6	14.9	17.2	20.2	22.5	24.9
15 minutes	17.3	23.6	27.9	32.1	37.8	42.1	46.6
1 hour	27.8	37.8	44.7	51.5	60.5	67.5	74.7
1.5 hour	31.9	43.4	51.3	59.1	69.5	77.5	85.7
2 hours	35.2	47.9	56.6	65.2	76.6	85.5	94.5
8 hours	47.9	65.2	77.1	88.8	104.4	116.5	128.8
24 hours	61.2	83.3	98.5	113.5	133.4	148.8	164.5
5 day	81.5	111	131.2	151.2	177.6	198.2	219.1

3.4 Potential Stormwater, Wastewater and Erosion Impacts

An overall analysis of the available data and the development plans reveals the following related to potential impacts:

- The facility presents a very low risk to adversely impacting surface water resources because:
 - Apart from minor bush clearing and trampling, and limited vegetation clearance and topsoil scraping to construct the Barleria PV and associated infrastructure, the development will leave the natural vegetation, soil conditions and topography largely undisturbed;
 - The roads have been well placed, as they lie completely outside of the natural water flowpaths;
 - No natural or artificial drainage channels were observed on the site or noted on any of the maps;
 - Sewage and landfill waste will be disposed of off site;

- Rainfall in the area is moderate to low, and no steep slopes exist to generate high flow velocities.
- Some potential impacts do exist, including:
 - Possible contamination of stormwater by:
 - Sediment that is collected in runoff due to the ground disturbance;
 - Oil leaks from the transformers;
 - Oil and lubricants in wash down water from the workshop; and
 - Overflow of wastewater from the conservancy tanks.
 - Potential erosion:
 - Where any stormwater drain concentrated discharges into rivers or onto the natural land surface; and
 - Potential usually exists in such developments to impede and disrupt flow and to cause damage to infrastructure and exacerbate erosion if infrastructure is placed within areas that are inundated in floods. However, this site has no water courses within its boundaries and there is no anticipation of infrastructure being inundated by floods.
- The impact of the two grid configurations:
 - Alternative 1: (see Figure 2) Substation situated approximately two and a half kilometres north-east of the Barleria site – this will have a greater impact during construction as the layout of the MV cabling and the location of the substation over a further distance compared to Alternative 2 would result in a greater disturbance of stormwater flows;
 - Alternative 2: (see Figure 3) Substation situated approximately one kilometre north-east of the Barleria site – this is the preferred option due to the substation being located closer to the facility as this would result in less disturbance to stormwater flows during the construction phase in comparison to Alternative 1.
 - However, please note that the impact based on the choice of configuration will be negligible and not have a great impact on stormwater management.

4 Project Specific Objectives

The project specific objectives were developed based on the site specific characteristics, regulations and guidelines mentioned in Section 3.2, and are as follows:

- Dirty water should not spill into clean water systems more than once in a 50-year return period;
- Collect and treat any dirty water before discharge;
- Do not impede surface or subsurface water flows unless unavoidable;
- Minimize the potential for erosion in large storm events >1:50-year flood events;
- Include a monitoring and inspection system for spills, leaks and erosion and commit to remediating where needed;
- Review and improve the SWMP regularly.
- Ensure no infrastructure, except road crossings and solar panel supports are built within the water courses;
- Do not build infrastructure, in particular infrastructure containing potential pollutants, within 300 m of natural drainage lines.

5 Hydrology Study

The first step in the SWMP development is an analysis of the development area and the proposed facility. The analysis found that the proposed facility is likely to have an intrinsically low impact on the surface water resources (see Section 3.4).

5.1 Delineation of clean and dirty areas

The development area is divided into clean and dirty areas as follows:

- Dirty areas:
 - The workshop where oils and lubricants may be stored and used
 - A chemical storage area will be constructed for the operational phase of the project, which will include proper containment and bunding for all chemicals stored on site;
 - The medium-voltage transformers (at the inverter stations) placed around the development area, as these will contain oil;
 - Transformers at the substation, as these will contain oil;
 - The conservancy tanks, as this will contain sewage; and,
 - Vehicle wash bay that has a hardstanding surface on which vehicles are washed, generating dirty water which drains to a sump.
- Clean areas are deemed to be all areas on the site outside of those stated above as dirty areas.

5.2 Identification of road crossings

No potential roads crossing watercourses were identified for all the roads that will be upgraded or built as part of the project. However, if changes are made to the road layout at the detailed design stage, potential road crossings will have to be re-assessed.

5.3 Delineation of catchments

In order to delineate the catchments, a Digital Terrain Model (DTM) was created in order to use GIS techniques to determine these delineations and characterisation of the various catchments. No detailed survey information was available at the time of the study, so 20 metre and 5 metre contours (where available) were sourced from ngi.gov.za and compared to elevation data on Google Earth.

The catchments draining from the site were delineated. The outlet of the catchment was taken as the closest likely discharge point or closest mapped water course.

The catchments are as shown in Figure 5 below. Catchments A, B and C will drain in a southerly direction from the site towards tributaries of Hartsrivier. Consequently, the stormwater from the site could drain south-westerly towards the Hartsrivier.

5.4 Catchment Parameters

The slope of a catchment is a very important characteristic in the determination of flood peaks. Steep slopes cause faster runoff shorten the critical duration of flood inducing storms, thus leading to higher rainfall intensities in the runoff formulae. On steep slopes, the vegetation is generally less dense, soil layers are shallower, and there are fewer depressions, all of which cause water to run off more rapidly. The result is that infiltration is reduced, and flood peaks are consequently elevated. For flat catchments such as those encountered on this site, the opposite holds true.

Land use is another critical characteristic as it alters the vegetation present and the degree of soil compaction. Compacted soil is less permeable, and vegetation can slow down stormflows over the land surface. Lastly, the soil type can also be important with some soils allowing quicker infiltration of water. These contribute to the estimation of volume of water stored, infiltrated and ultimately resulting in runoff for each catchment.

The development area is characterised by flat slopes and moderately permeable land. The average slope and other critical parameters for the catchments under consideration are presented in Table 2.

Table 2: Conceptual Catchment Characteristics

Catchment	Catchment Slope (%)	Catchment Area (km ²)	Permeability (Visual assessment, not lab tested)	Flow type	Vegetation
Catchment A	0.2	15.1	Permeable to Semi-Permeable	Overland Flow	Grasslands, Light Bush and farm-lands
Catchment B	0.2	13.7	Permeable to Semi-Permeable	Overland Flow	Grasslands
Catchment C	0.5	13.3	Permeable to Semi-Permeable	Overland Flow	Grasslands

5.5 Storm Peaks

The hydrological and hydraulic parameters of all the catchments contributing towards the study area were calculated and the overland peak flow rates were determined in the study area. The Rational Method model was used to estimate peak flow rates based on the catchment parameters and rainfall intensity.

Storm peaks were calculated for the catchments shown in Figure 5, and peak flows generated within each sub-catchment are considered conceptual due to lack of detailed contour data (topographical survey data).

The peaks are relevant to both pre-development and post-development scenarios, because the vegetation, topography and soil conditions will largely remain the same, except where the main buildings (O&M building, stores, etc.) are placed, and this accounts for a negligible proportion of the development area from a surface area viewpoint.

Note that wash water was not considered in the storm peaks, because solar panel washing is unlikely to be done in the rainy season, and volumes will be negligible in comparison to storm volumes. The implications of the storm peaks calculated, and their impact on the SWMP, are discussed in Section 6.

Table 3: Peak Flows for Conceptual Catchments in cubic metres per second

Catchment	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
Catchment A	6.3	9.4	12.1	15.6	22.7	30.5
Catchment B	6.9	10.4	13.4	17.2	25.0	33.7
Catchment C	7.6	11.4	14.7	18.9	27.5	37.0

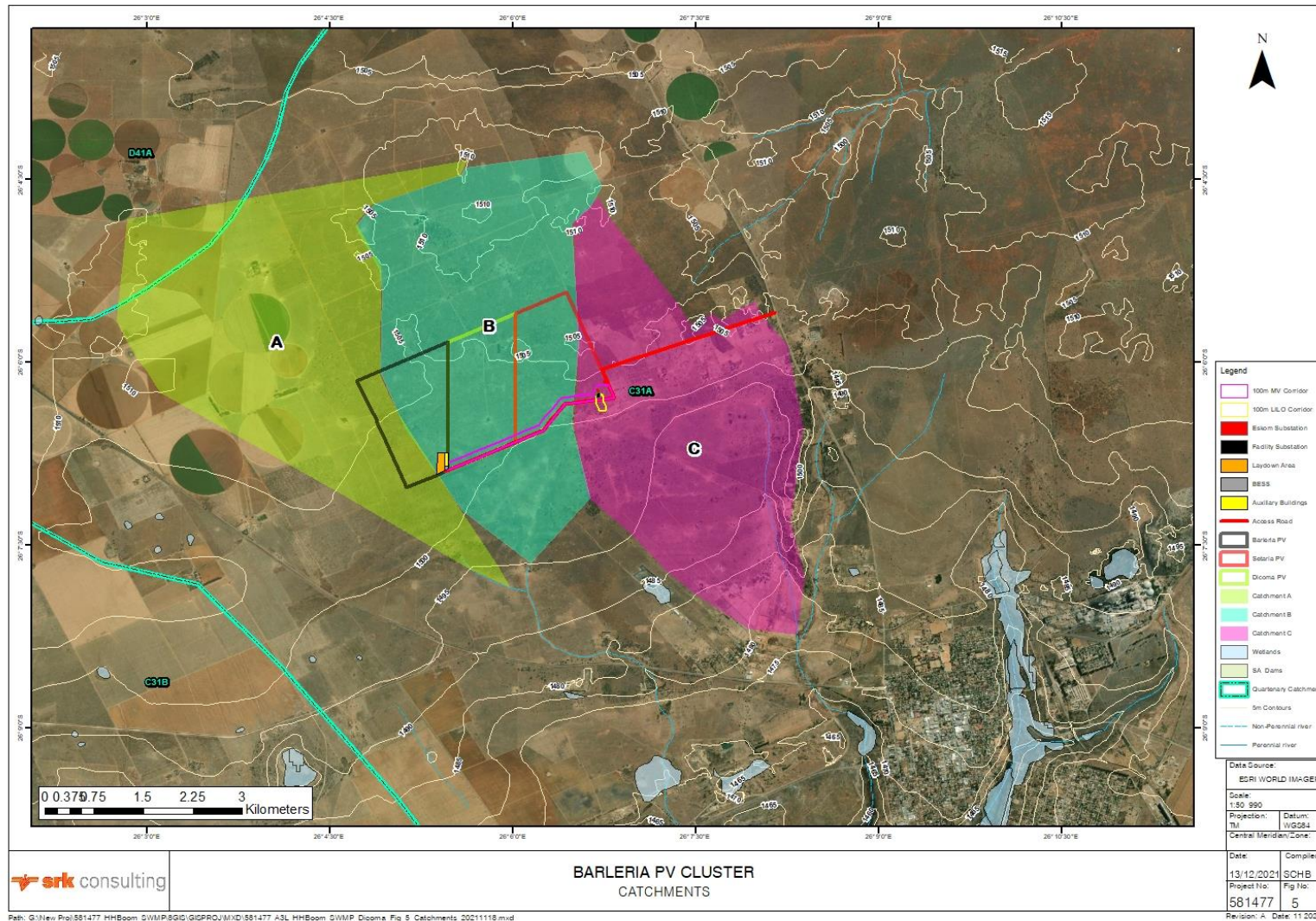


Figure 5: Conceptual Stormwater Catchments for the Proposed Development

6 Conceptual Design Review

This section provides detail on why management approaches were selected, any alternatives that should be considered, and further steps required to confirm or improve the conceptual plan.

6.1 Waste and wastewater management

Waste will be disposed of at a registered landfill site and domestic wastewater at a licensed wastewater treatment plant (i.e. waste will be treated off site), hence, the SWMP only focuses on temporary storage on site.

Domestic waste should be stored out of the rain and wind, collected (and disposed of) regularly as is currently proposed for the development.

The conceptual design of the wastewater (sewage) conservancy tank was not within the scope of this report, however, the current conceptual plan was evaluated in terms of the risks that this may pose to surface water. Poor management of the tank is the main risk, because the system could fail if the tank is not emptied regularly resulting in overflows. Consequently, a float switch controlled alert system is recommended.

Oil and lubricants in the workshop, and oil from the transformers must be banded (See Section 6.5 for banding requirements) as per legal requirements and hence, this was recommended without any alternatives.

6.2 Channels, diversions and dissipaters

It is standard practice to place channels on the upgradient side of roads to control erosion. However, in this case, channels are not recommended as the terrain is extremely flat and channels will only lead to an unnecessary concentration of flow. This is further supported by the fact that no erosion was noted on or near the existing roads and none of these roads included channels adjacent to them.

Channels should be included to divert clean water around any dirty areas unless these are already banded.

Solar panel areas are not considered dirty, and it is not recommended that runoff from upstream catchments be diverted around these solar panel areas.

For the few places where diversions are recommended (non-banded dirty areas), high-level conceptual designs were developed (i.e. typical drain and dissipater types). These were based on the following preliminary conclusions:

- Peak flows for the stormwater catchments are low;
- The area is under 0.6% grade, and it is possible to design earth or gravel drains rather than concrete drains, because low erosion potential exists at these low flow gradients; and
- Even though low velocity flows will be a feature in the drains, dissipaters are recommended at any outlets to control the transition of water from concentrated channel flow to overland dispersed flow or in-river flow – in addition, it is possible that outlets (e.g. adjacent to road/river crossings) could be locally steep.

Typical generic conceptual designs, based on the above discussions, were compiled as shown in Figure 6.

6.3 Road crossings

No potential road crossings were identified however, if changes are made to the road layout at the detailed design stage and road crossings are required, the typical conceptual design in Figure 6 is recommended.

6.4 Erosion and sediment transport

In general, the main erosion risks on a solar facility are channel outlets (Section 6.1), roads, road crossings (Section 6.3) and stockpiles. However, based on the site visit, erosion on roads is excluded as a risk as this is unlikely as long as the roads have no significant camber.

No road crossings exist and thus no opportunities for erosion and sediment transport currently exist.

In the case of stockpiles, temporary stockpiles should have diversion berms or silt fences. One permanent stockpile is planned for the topsoil that is to be used in decommissioning of the facility. This stockpile will be placed near the substation or O&M Building. The stockpile, if possible, should have gentle slopes of 1 in 5 or less to encourage revegetation and limit erosion. The stockpile should be bunded until it revegetates. The gentler slopes will necessitate a stockpile with a larger surface area. This is considered the lower impact option as it limits erosion even though it disturbs more surface area.

Sometimes, material excavated during construction of the panel foundations might be significant (cumulative volume). If that is the case, the material should be removed from site responsibly (e.g use as cover material on a landfill site).

6.5 Bunding

Requirements for bunding of areas housing potential contaminants are specified in detail in the National Norms and Standards for the Storage of Waste (Notice 926 of 29 November 2013, Department of Environmental Affairs, National Environmental Management: Waste Act 2008, Act No.29 of 2008). The specification, which will apply to the development area, reads as follows: “*bunds having a capacity which can contain at least 110% of the maximum contents of the waste storage facility. Where more than one container or tank is stored, the bund must be capable of storing at least 110% of the largest tank or 25% of the total storage capacity, whichever is greater (in the case of drums the tray or bund size must be at least 25% of total storage capacity).*”

Bunded areas should be sized and sealed to ensure spilled contaminants cannot leak out of the bunded areas.

6.6 Monitoring and management

Monitoring and management are key to the success of a SWMP. The following are therefore included as a key aspect of SWMP:

- Frequent inspections until the success of the design and any unexpected problems are resolved / confirmed and maintenance frequency is determined;
- Review of the plan after a few years to improve, where possible, its practicality, cost-effectiveness or efficacy;
- Alerts that do not rely on a full-time environmental manager on site (which may not be feasible) including:
 - Automatic alert systems for the wastewater conservancy tank (e.g. a float driven switch alert system);
 - Brief, annual refresher training on stormwater protection that should not take more than fifteen minutes for each staff member; and
 - Well placed signs that remind staff members of reporting of incident / issues, as soon as possible and reduce the likelihood that forgetfulness or confusion will prevent reporting.

7 Stormwater, Wastewater and Erosion Management Plan

The SWMP, including wastewater management, is summarised in Table 4 and Figure 6.

Table 4: Construction and Operations / Maintenance SWMP

General principle	Specific outcomes	When	Ref No.	Focus area	Action	Responsible party
Separate clean - and dirty water to ensure clean water remains uncontaminated	Temporary containments and diversion (designed for a 1 in 5-year event)	During contractors site establishment	1	<ul style="list-style-type: none"> Stockpiles; Laydown areas; Workshops; and Any other area likely to generate sediment during a storm event or contain contaminants that can be disbursed. 	Clean water diversions or bunds: Construct stormwater drains or bunds to divert clean runoff around dirty areas. The diversion should be sized for 1 in 5-year event. Typical design will be an excavated earth channel or berms. For the permanent topsoil stockpile, berms and channels to remain in place until stockpile revegetates.	Construction contractor's onsite environmental officer/representative
	Permanent containments and diversions (designed for a 1 in 50-year event)	Constructed prior to operation	2	<ul style="list-style-type: none"> The workshop and chemical stores; Transformers, inverters and substations (if not bunded); and Wastewater conservancy tank. 	Clean water diversions or bunds: Construct stormwater drains or bunds to divert clean runoff around the workshop, chemical stores, transformers, inverters, substations and wastewater conservancy tank. The diversion should be designed for a 1 in 50-year event.	Included in detailed designs of design engineer and carried out by contractor appointed for construction
Collect and, where required, treat dirty water or runoff from any dirty areas.	Dirty water should not have the potential to spill into clean water systems more than once every fifty years (where influenced by stormwater)	Before stockpiles are deposited	3	Stockpiles	Construct silt fences or berms: to prevent the sediment transport into rivers. All stockpiles to be removed after construction phase ends except permanent topsoil stockpile for decommissioning. Berms to remain around topsoil stockpile until it revegetates.	Included in detailed designs of design engineer and carried out by contractor appointed for construction
		Throughout construction	4	Waste	Dispose of landfill, oils and other contaminants offsite	
		During site establishment	5	Sewage	Supply chemical toilets	
		Constructed prior to operation	6	Workshop	Workshop collection drain with oil and grease trap: Construct a small concrete drain collecting all water, potentially containing oils and lubricants, from workshop floor and directing it through an oil and grease trap before discharge (or removing to offsite facility). Floor to be sloped such that all water will collect in drains.	
		Inspect every 3 months for first 2 years and then revise	7	Workshop	The oil and grease traps are to be inspected and, when necessary, cleaned and waste taken to a registered offsite facility	Workshop manager and assurance by environmental manager
		As required when the tank is full	8	Transformers	Dispose of any spent oil, removed from transformers during maintenance, to a registered offsite facility	
		As required when the tank is full	9	The sewage conservancy tank	Regularly collect sewage in the conservancy tank and disposed of at a licensed municipal sewage treatment plant.	
Bund any hazardous substance or pollutant storage areas (including any oils), as per regulations	Throughout construction	10	General	Construct temporary bunds for any chemicals such as oils or fuel stored on sited during construction. Bunds must contain at least 100% of the volume of the container. If all containers are stored together the bund must store at least 110% of the largest container or 25% of the total storage capacity, whichever is greater. Suitability of the material of bund must be investigated whenever a new substance is added to the bund	Included in detailed designs of design engineer and carried out by contractor appointed for construction	
	Constructed prior to operation	11	Transformers	All transformers will be bunded with bund capacity of at least 110% of the maximum volume of oil in the transformer. Transformers and bund will be protected from rainfall by small covers or roof or housed in containers, as applicable.		
		12	The sewage conservancy tank	The sewage conservancy tank will be a closed tank with an automatic alert system.		
	During operation: as and when containers are purchased	13	Workshop	Small trays for workshop chemicals: Bund any containers with oils and lubricants by placing them in plastic trays that is at least 100% of the volume of the container. If all containers are stored together the bund needs to store at least 110% of the largest container or 25% of the total storage capacity, whichever is greater. Suitability of the bund must be investigated whenever a new substance is added to the bund.	Workshop manager and assurance by environmental manager	
Do not impede surface and	Minimise dirty areas such that surface and subsurface	Constructed prior to operation	14	The workshop, transformers, wastewater conservancy tank	Place diversion channels directly upstream of dirty areas such that dirty area catchments are minimised in footprint	Included in detailed designs of design engineer and carried out by

General principle	Specific outcomes	When	Ref No.	Focus area	Action	Responsible party
subsurface flow along drainage lines	movement of water along the drainage lines is not impeded	Throughout construction	15	<ul style="list-style-type: none"> Laydown areas; and Stockpiles 	Minimise laydown areas and stockpiles. The permanent topsoil stockpile is excluded from this as it will be the natural topsoil from the area and gentler slopes are recommended which will necessitate a larger area.	contractor appointed for construction
	Ensure any engineered clean stormwater drainage directs water to the closest naturally receiving drainage line		16	All drains	Ensure that any temporary stormwater drains or diversion berms direct water towards the drainage line to which it would naturally flow	
		Constructed prior to operation	17	The workshop, transformers, wastewater conservancy tank	Drains to follow natural topography, Ensure outlets drain towards the natural drainage line that would originally have received flow from that area	
Control, monitor and manage erosion	Prevent erosion in general	Constructed prior to operation	18	All areas	Do not disturb the natural topography or vegetation between the solar panel installations	Included in detailed designs of design engineer and carried out by contractor appointed for construction
		During operation	19		No stockpiles if possible except for the permanent topsoil stockpile.	Environmental manager
	Minimize erosion in large storm event of 1 in 50- years or greater	Constructed prior to operation	20	All drains	Drains sloped and sized such that velocities do no exceed 1 m/s	Included in detailed designs of design engineer and carried out by contractor appointed for construction
			21	Road crossings	Line all major drifts on road crossings with material sufficient to prevent erosion during high flow (e.g. gravel or concrete). If concrete is used, place a section of riprap (larger rocks) underlain by gravel and with gravel on either side to facilitate a smooth flow transition. Detailed modelling and design of road crossings such that erosion is controlled to be a feature of the detailed design.	
			22	All drains	Dissipaters: At drain outlets widen the channel and use riprap (can be sourced from spoil during construction) or reno mattresses to dissipate stormwater flows	
	23	Road crossings	Dissipation at road crossings: Detailed modelling and design of road crossings including riprap (can potentially be sourced from spoil during construction) or reno-mattresses.			
	Prevent erosion in general	Throughout construction	24	All	Maintain natural topography and vegetation: Do not disturb the natural topography or vegetation where possible	Construction contractors onsite environmental officer/representative
	Minimize erosion in large storm event of 1 in 5-years or greater		25	All drains	Engineer low velocity temporary drains: Drains sloped and sized such that velocities do no exceed 1 m/s in a 1 in 5-year event	
		Early in construction	26	Road crossings	Engineered temporary drifts: Build roads and road crossings before other infrastructure.	
	Ensure that any chronic erosion is detected and rehabilitated within 6 months	Every 3 months for the first 2 years and annually thereafter	27	<ul style="list-style-type: none"> PV cell blocks; Drains; Outlet of all Drains; and All-natural drainage lines that cross the access road. 	Inspect all focus areas for erosion. If erosion is found, remediate and redesign the drainage in the area. If erosion is found in a natural drainage line, conduct an assessment and determine the cause. Develop a plan to prevent future erosion.	Environmental manager or hydrologist/engineer/environmental scientist appointed by the environmental manager
	Ensure that any acute erosion due to large storm events is detected within 2 weeks.	Install prior to operation	28	Main office	Install a rain gauge that can measure greater than 150 mm.	Included in detailed designs of design engineer and carried out by contractor appointed for construction
		After a rain event of greater than 150 mm in one day (a 10 year - 24-hour rain event) or when staff notice flood damage.	29	All-natural drainage lines that run through the site	Inspect and remediate acute erosion: Inspect all focus areas for erosion. If erosion is found remediate and redesign the drainage in the area. If erosion is found in a natural drainage line conduct and assessment and determine the cause and develop a plan to prevent future erosion.	Environmental manager or hydrologist/engineer/environmental scientist appointed by the environmental manager
		Design and development prior to operation	30	All	Set up rain data system: Build or buy a basic rain program, preferably electronic, that allows site staff to enter rain data from the rain gauge. Ideally the system should let the environmental manager and site manager when a rainfall event in excess of 150 mm.	
		Daily	31	Main office	Record rain data: Read and record rain gauge daily;	Onsite staff member tasked by the Environmental manager

General principle	Specific outcomes	When	Ref No.	Focus area	Action	Responsible party	
		Update annually in case of staff change	32		Signs at main office to aid problem reporting: Ensure that a sign providing the following is posed in the reception area, the control room, on each transformer and in the workshop: The name, telephone number and email address of the environmental manager. The sign should state: "If you notice any leaks or spills or erosion anywhere on the property please contact the Environmental Manager by one of these methods..."	Environmental manager	
	Training	Annually	33	All	Training: Provide a short briefing to all construction staff on the dynamics of erosion and leaks that covers at least: <ul style="list-style-type: none"> How to identify erosion; How to identify a leak, including car leaks; Where to find contact details of the environmental officer/representative in case of leaks or erosion. 	Environmental manager or hydrologist/engineer/environmental scientist appointed by the environmental manager	
	Ensure that any erosion is detected and rehabilitated	After rain events	34		Inspect the site for erosion after rain events. If erosion is found, remediate and redesign the drainage in the area. If erosion is found in a natural drainage line, conduct an assessment to determine the cause and develop a plan to prevent future erosion.	Contractors environmental officer/representative	
		During site establishment	35	Install a rain gauge that can measure greater than 150 mm. This rain gauge will also be used during operation.			
Monitor and manage stormwater system	Include a monitoring system for spills and leaks such that they are detected as soon as possible.	Once every 2 weeks during Construction	36	All	Leak inspection: regularly check for leaks and for any breaches or evidence of spills or any other problems not in adherence to this SWMP. All cars should also be checked for oil leaks and any leaks found should be stopped immediately, the cause of the leak identified, the problem remediated such that no further leaks occur, and any contaminated soil or water assessed and remediated.	Contractors environmental officer/representative	
	Include a monitoring system for spills and leaks such that they are detected as soon as possible.	Every 3 months for the first 2 years and annually thereafter (Operation)	37		Leak inspection: regularly check for leaks and for any breaches or evidence of spills or any other problems that would indicate that it is not in adherence to this plan. All cars should also be checked for oil leaks during the inspection. Any leaks found should be stopped immediately, the cause of the leak sought, the problem remediated such that no further leaks occur, and any contaminated soil or water assessed and remediated.	Environmental manager or hydrologist/engineer/environmental scientist appointed by the environmental manager	
		Continuous	38		Data capture, training and signs: see 32, 33, 34, 35, 36, & 37	Environmental manager and staff in general	
		Construct prior to operation		39	The sewage conservancy tank	Sewage conservancy tank alert system: Install a float switch-controlled alarm that will alert the control room when the conservancy tank has less than 2 weeks of capacity remaining.	Included in detailed designs of design engineer and carried out by contractor appointed for construction
				40	Transformers	Signs at transformers: Post a sign on transformers stating "If you notice any leaks or spills or erosion anywhere on the property please contact reception via one of the following methodsand report it"	
General	Do not build infrastructure within near to watercourses	Detailed design	41	All	Ensure no infrastructure except roads, solar panels and solar panel supports are built within 300 m of a water course. In particular, ensure no dirty areas, that may contain pollutants, are within 300 m of the water course	Design engineer or engineer appointed by the design engineer	
	Do not build infrastructure containing potential pollutants in any of the natural drainage lines.		42		Ensure that final infrastructure plans do not propose any potentially polluting infrastructure, such as transformers, workshops or conservancy tanks in the natural drainage lines (currently none are proposed)		
	Review and improve stormwater management plan regularly.	Once every 5 years	43		Review and improve the stormwater plan	Environmental manager or engineer appointed by the environmental manager	
	Review and inspect	Once every 2 months during construction depending schedule	44		Inspect the site to ensure adherence to the stormwater management plan	Clients' environmental representative or engineer	
	Do not place stockpiles or other potentially polluting construction items within 300 m of the watercourse	Detailed design and throughout construction	45		Do not place laydown areas, stockpiles within 300 m of the watercourse	Design engineer or engineer appointed by the design engineer	
	General	Detailed design	46		Develop a specific environmental specification for any construction including, but not limited to, the actions in this stormwater management plan and its principles	Clients' environmental representative or specialist	
	Prepare for spills	Construction and Operation	47		Procure spill kits and place in areas where fuel or oils are transferred (e.g. workshops)	Environmental manager	

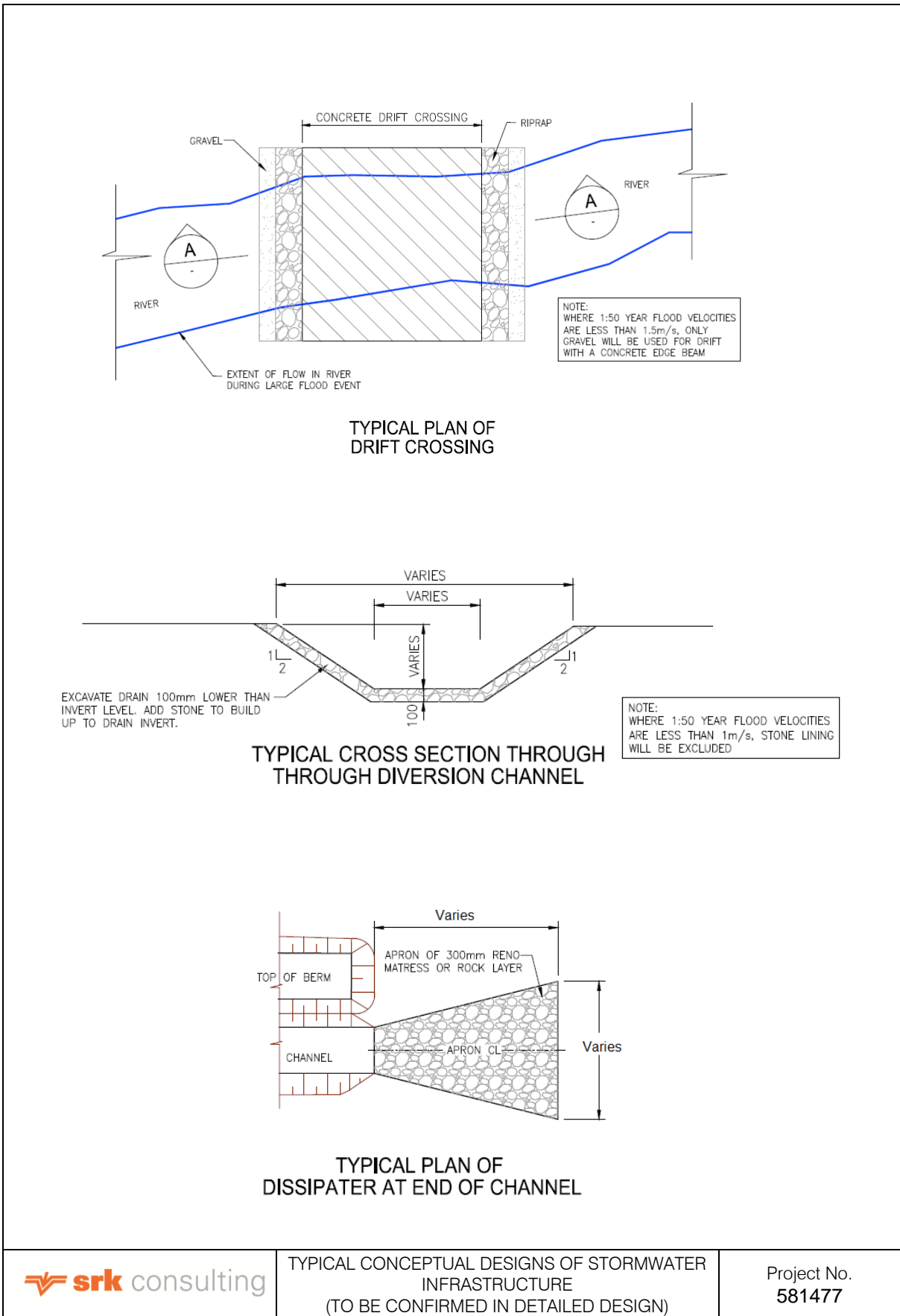


Figure 6: Typical Conceptual Designs of Stormwater Infrastructure

8 Conclusion and Recommendations

In conclusion:

- The proposed facility will have an intrinsically low impact on surface water resources;
- The second grid configuration (Alternative 2) would result in a lower impact on stormwater, however the difference in impact between the two alternatives is insignificant;
- The potential stormwater impacts that do exist can be managed in a practical and cost-effective way; and
- The plan is conceptual, because no detailed contour data is available and only conceptual infrastructure layouts were made available at the time of the study – that said, moderate to low rainfall and low flow gradients characteristic of the area suggest that detailed design should not vary considerably from the concepts presented in this report

It is recommended that the SWMP be developed further during the detailed design by:

- Conducting a detailed topographic survey;
- Developing a stormwater layout and designs based on the above information and infrastructure layout plan;
- Developing conceptual designs into detailed designs; and
- The plan should be incorporated into an environmental specification for use during construction and incorporated into the operational environmental management of the site

Signatures

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

This report, Stormwater, Wastewater and Erosion Management Plan for Barleria PV (Pty) Ltd, was prepared and reviewed by the SRK personnel presented below.

Prepared by

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WASTE MANAGEMENT PLAN

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 on site.

This WMP has been compiled as part of the project 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 should further detail regarding waste quantities and categorisation become available, during the construction and/or operation stages.

2. RELEVANT ASPECTS OF THE SITE

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

Waste generated on site, 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, PVC, LDPE) and cardboard.
- » Organic waste from food waste as well as alien and endemic vegetation removal.
- » Sewage from portable toilets and septic tanks.
- » Inert waste from spoil material from site clearance and trenching works.

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); and
- » 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 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; and
- » Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner.

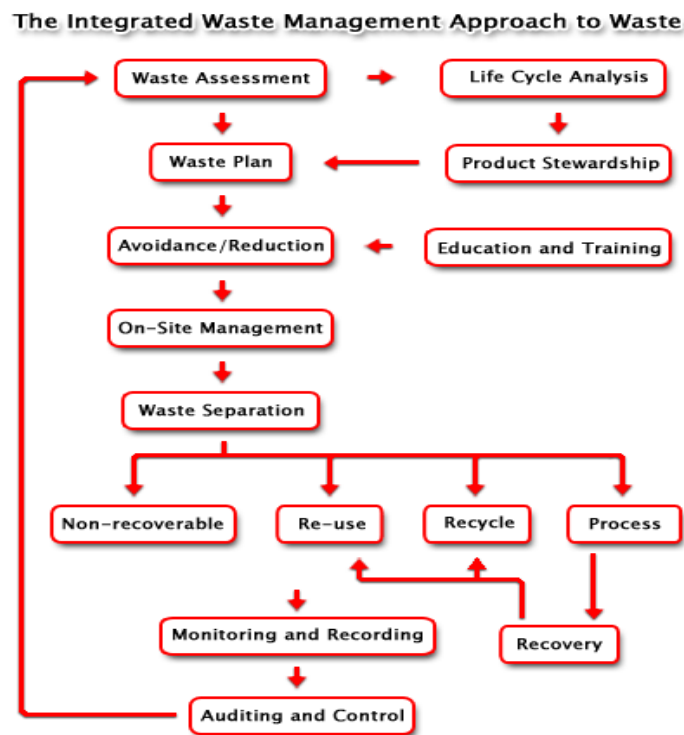


Figure 1: Integrated Waste Management Flow Diagram
(Source: <http://www.enviroserv.co.za/pages/content.asp?SectionId=496>)

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 and/or ECO.

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 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.
- » Septic tanks and portable toilets must be monitored by the EO or responsible subcontractor and maintained regularly. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from moving around in the surrounding area.
- » 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 site for the storage of all waste streams before removal from site. The storage period must not trigger listed waste activities as per the NEM:WA, GN R921 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 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' 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

- » 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 stormwater system separating clean and contaminated stormwater.
- » Collection bins placed around the site 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 removed 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 site 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 ECO.

4.1.5. Record keeping

The success of the Waste Management Plan 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 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; and
- » 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.

PRINCIPLES FOR TRAFFIC MANAGEMENT

1. PURPOSE

The purpose of this Traffic Management Plan (TMP) 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 project site. The objectives of this plan 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 site.
- » 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. RELEVANT ASPECTS OF THE PROJECT

The project site is traversed by existing roads, namely the R505, and D2435 gravel District Road. In general, the traffic of the area is considered to be low.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

- » Prior to the commencement of construction, the contractor must develop their own detailed Transport Management Plan (TMP) based on traffic volumes and road carry capacity outlines.
- » 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 site. 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.
 - * Traffic signs used must conform to the National Road Traffic Act and South African National Standards.
 - * Appropriate signs must be installed at locations as deemed necessary.
 - * Signage must be placed at intersections, speed limit alterations, severe changes in road grading, where road hazards are located and where usual traffic flow changes abruptly.
 - * All traffic signs must be obeyed by all staff and visitors on site, without exception.
- » The EPC Contractor must review the location of the designated access and will be responsible for ensuring construction travel is limited to designated routes. The entrance of the main access road must not be constructed before a blind rise or on a bend of the public road.
- » 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 project site and must be maintained until construction is completed on the site.
- » Speed limits must be established prior to commencement of construction and enforced for all construction traffic. The following limits are suggested for internal roads:
 - * 60 km/hour where sign posted.
 - * 40 km/hour where sign posted.
 - * 20km/hour around workshop areas, in all car parks and yards.
 - * A warning system, penalties or fines must be put in place where speed limits are not adhered to.
- » 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.
- » Inspect traffic/road signs regularly for cleanliness, condition and appropriateness. Take immediate action to rectify any problems with signage.
- » 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 should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.
- » A driver must not use the vehicle's horn except on the grounds of safety.
- » Drivers of vehicles must always keep to the left and must be observant of other road users.
- » Drivers must follow communication procedures and shall where applicable be trained in the correct use of two-way radios.
- » Ensure all staff are trained upon entering the site regarding the meaning and correct response to each traffic sign utilised on site.
- » All light vehicles must be fitted with a flashing amber strobe or revolving light.
- » Persons authorized to operate on site must have a legal valid appropriate code provincial driver's license and competency certificate where applicable.
- » No passengers allowed in any construction vehicles. If an assistant is required, they must obtain permission
- » Vehicles must be maintained at approved intervals and must be inspected daily before use to ensure safe operation.
- » All vehicles must only be used within the design specifications and limits set by the manufacturer.

- » All construction vehicles will be used according to the Health & Safety Plan and related Method Statements and/or Risk Assessments.
- » Weather and road conditions must be sufficient to allow safe operation to proceed. Head lights must be turned on at all times.
- » No vehicle will be driven with any defect that may impact on the safe operation of that vehicle.
- » Two-way radios shall only be used for official/work related matters.
- » The use of mobile phones while driving a vehicle is prohibited.
- » All vehicles shall carry a fire extinguisher (Dry Powder); 2.5kg for light vehicles, 4.5kg for haul trucks and 9kg for machinery.

4. 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.

EMERGENCY PREPAREDNESS, RESPONSE AND FIRE MANAGEMENT PLAN

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 construction 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. POTENTIAL RISKS

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; and
- » 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 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 banded 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. 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 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 in the environment 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 extinguisher, 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 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

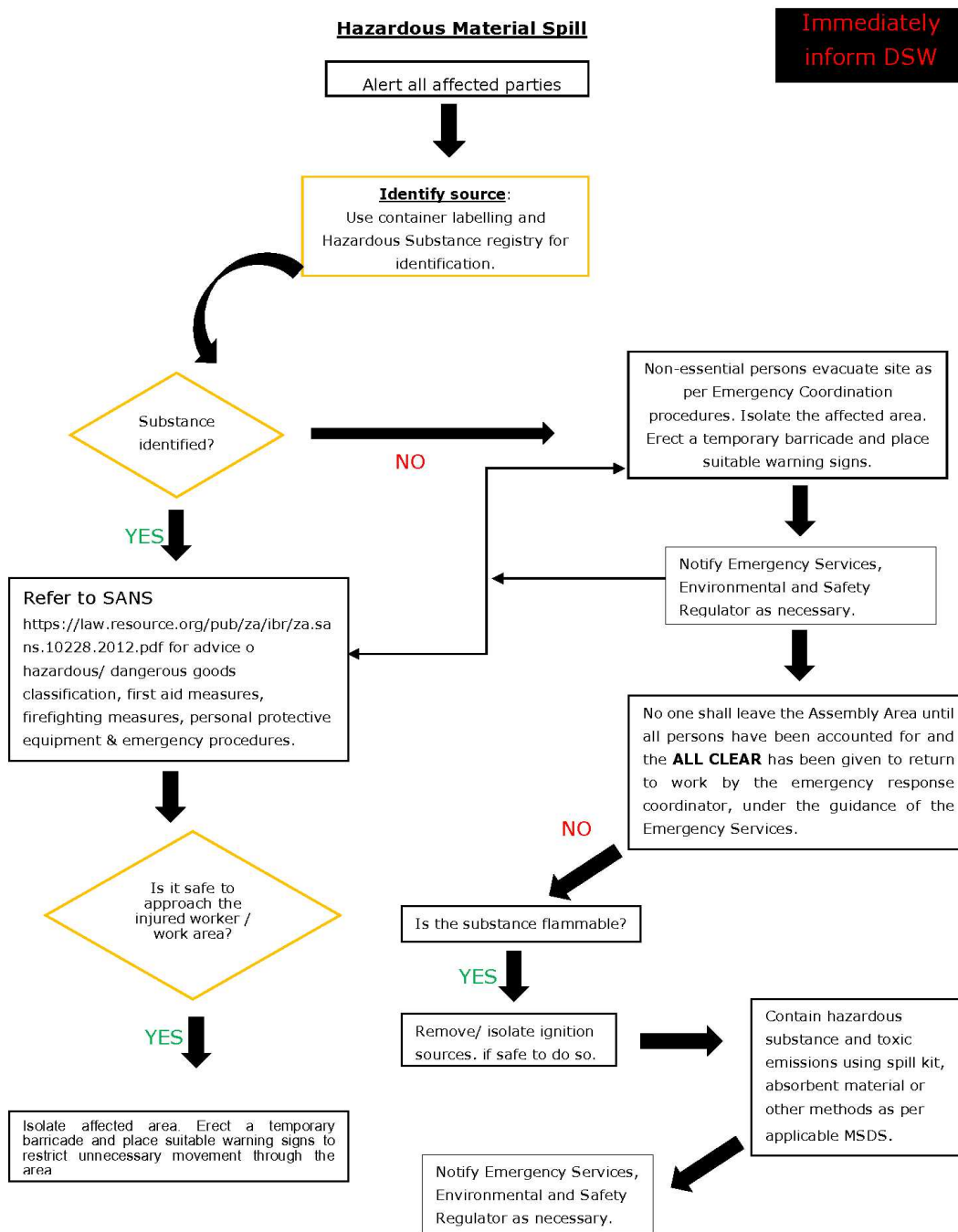


Figure 1: Hazardous Material Spill

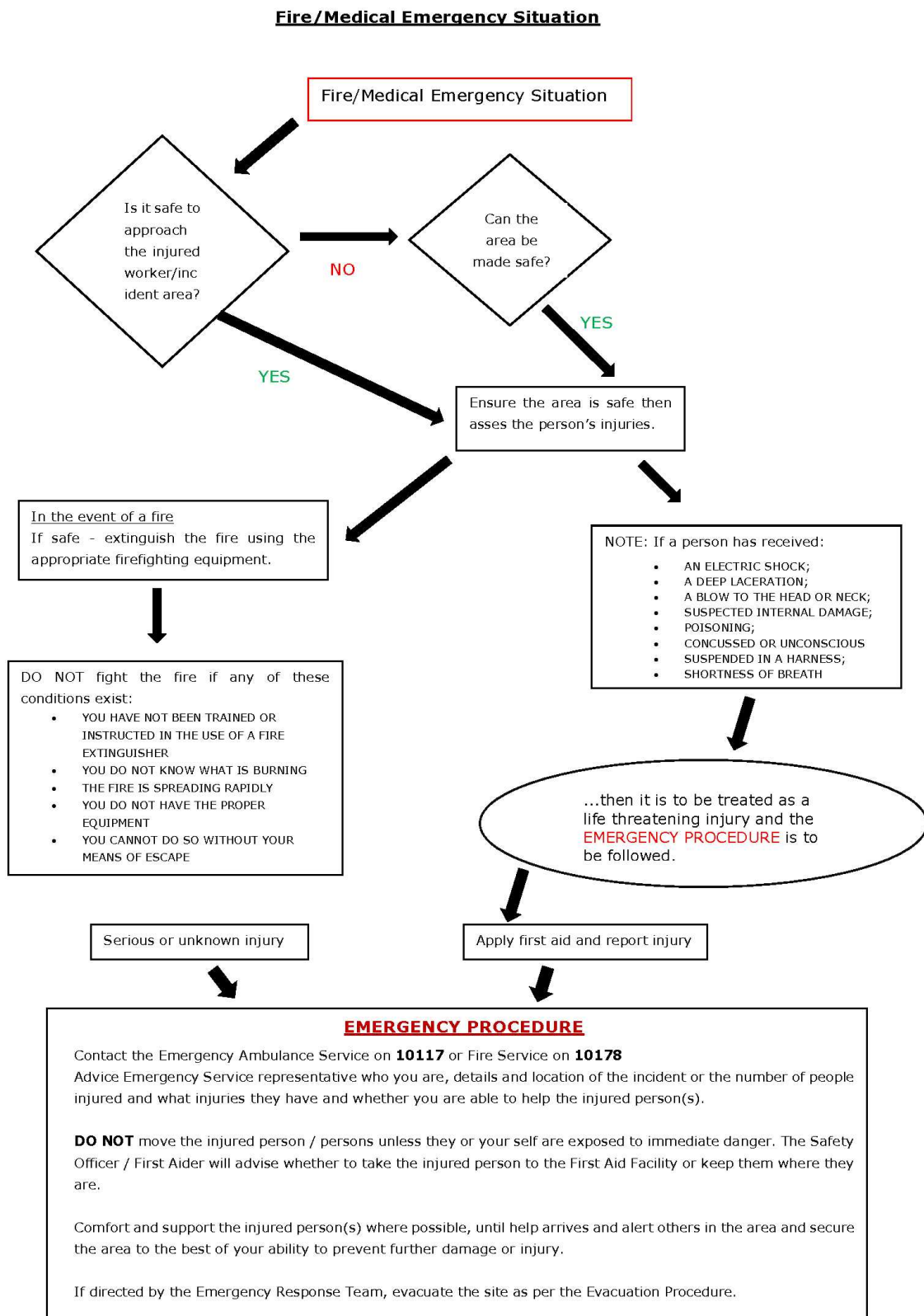


Figure 2: Emergency Fire/Medical

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 EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues.

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.

CHANCE FIND PROTOCOL – HERITAGE RESOURCES

1. PURPOSE

Potential impacts on heritage resources can occur during construction as a result of unearthing during construction. This protocol outlines the procedures to be followed in the event that a heritage resource is uncovered.

Palaeontological finds

Monitoring Programme for Palaeontology is to commence once the excavations for all structures and infrastructure begin. The following procedure is only required if fossils are seen on the surface and when excavations commence.

1. When excavations begin the rocks must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (silicified wood, plants, insects, bone, shells) should be put aside in a suitably protected place. This way the construction activities will not be interrupted.
2. Where possible, photographs of similar fossils must be provided to the contractor to assist in recognizing the fossil plants and bones that might be encountered on site. This information must be built into the EMPr's training and awareness plan and procedures.
3. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
4. If there is any possible fossil material found by the Contractor/environmental officer then a qualified palaeontologist should visit the site to inspect the selected material and check the excavations where feasible.
5. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site, a South African Heritage Resources Agency (SAHRA) permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
6. If no good fossil material is recovered, then any site inspections by the palaeontologist will not be necessary.
7. If no fossils are found and the excavations have finished, then no further monitoring is required.

Archaeological finds

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

1. The heritage resource must be avoided and all activities in the immediate vicinity temporarily ceased.
2. A suitably qualified specialist must be informed and commissioned to consider the heritage resource, either via communicating with the Environmental Officer via telephone or email, or based on a site visit.
3. Appropriate measures are to be provided by a qualified specialist towards immediate management of the heritage resource.

4. Should the specialist conclude that the find is a heritage resource protected in terms of the NRHA (1999) Sections 34, 36, 37 and NHRA (1999) Regulations (Regulation 38, 39, 40), the specialist must notify SAHRA on behalf of the Developer.
5. If required by SAHRA, the specialist must conduct a HIA in terms of NHRA Section 38 that must include rescue actions/excavations.

Graves

Should any unmarked human burials/remains be found during the course of construction:

1. Work in the immediate vicinity should cease and the find must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA).
2. Where human remains are part of a burial they would need to be exhumed under a permit from SAHRA (for pre-colonial burials as well as burials later than about AD 1500).
3. For newer graves, should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) Section 35 and NHRA (1999) Regulations (Regulation 38, 39, 40) SAHRA may require that an identification of interested parties, consultation and /or grave relocation take place;
4. Consultation must take place in terms of NHRA (1999) Regulations 39, 40, 42;
5. Grave relocation must take place in terms of NHRA (1999) Regulations 34.
6. These measure should be undertaken by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions, laws and by-laws pertaining to human remains.
7. If required by current, relevant legislation, a full social consultation process should occur in conjunction with the mitigation of cemeteries and burials.
8. Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures required for grave relocation have been met.

CURRICULUM VITAE OF KAREN JODAS

Profession:	Environmental Management and Compliance Consultant; Environmental Assessment Practitioner. Professional Natural Scientist: Environmental Science since 1999.
Specialisation:	Strategic environmental assessment and advice; development of plans and guidelines; environmental compliance advise and monitoring; Environmental Impact Assessment; environmental management; project management and co-ordination of environmental projects; peer review; policy, strategy and guideline formulation; renewable energy projects; water resources management.

VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in strategic evaluation, Environmental Impact Assessment studies, environmental management plans, programmes and guidelines, integrated environmental management, environmental compliance monitoring; peer review of EIA reports and processes, strategy and guideline development, and public participation. Key focus on overall Project Management, integration of environmental studies and environmental processes into larger engineering-based projects, strategic assessment, and the identification of environmental management solutions and mitigation/risk minimising measures.

Excellent working knowledge of environmental legislation, strategies, guidelines and policies. Compilation of the reports for environmental studies are in accordance with the all relevant environmental legislation under the National Environmental Management Act. Due consideration of Equator Principles and compliance with IFC performance standards is now a part of all projects.

SKILLS BASE AND CORE COMPETENCIES

Provide technical input for projects in the environmental management field, specialising in strategic evaluation, Environmental Impact Assessment studies, environmental management plans, programmes and guidelines, integrated environmental management, environmental compliance monitoring; peer review of EIA reports and processes, strategy and guideline development, and public participation. Key focus on overall Project Management, integration of environmental studies and environmental processes into larger engineering-based projects, strategic assessment, and the identification of environmental management solutions and mitigation/risk minimising measures.

Excellent working knowledge of environmental legislation, strategies, guidelines and policies. Compilation of the reports for environmental studies are in accordance with the all relevant environmental legislation under the National Environmental Management Act. Due consideration of Equator Principles and compliance with IFC performance standards is now a part of all projects.

SKILLS BASE AND CORE COMPETENCIES

- Twenty years (20) of experience in the environmental management, impact assessment and compliance fields
- Eighteen (18) years of experience in Project Management - Project management of large environmental assessment and management projects
- Strategic and compliance advise for all aspects of environmental assessment and management
- External and peer review of environmental assessment and compliance reporting as well as EIA processes
- Working knowledge of environmental planning policies, regulatory frameworks and legislation

- Input and review of Environmental Management Plans and Programmes, including Invasive Species Monitoring, Control and Eradication Plans
- Identification and assessment of potential environmental impacts and benefits
- Development of practical and achievable mitigation measures and management plans and evaluation of risk to project execution
- Experienced in environmental compliance advise, monitoring and reporting for construction projects
- Compilation and review of the reports in accordance with all relevant environmental legislation
- Public participation/involvement and stakeholder consultation
- Environmental strategy, policy and guidelines development
- Experienced in assessments for both linear developments and nodal developments
- Key experience in the assessment of impacts associated with renewable energy projects
- Wide range of experience for public and private sector projects
- Experienced consultant in projects in Sub-Saharan Africa.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc Earth Sciences, majoring in Geography and Zoology, Rhodes University, Grahamstown, 1993
- B.Sc Honours in Geography (in Environmental Water Management), Rhodes University, Grahamstown, 1994. Major subjects included Water Resources Management, Streams Ecology, Fluvial Geomorphology and Geographic Information Systems.
- M.Sc in Geography (Geomorphology), Rhodes University, Grahamstown, 1996

Short Courses:

- Environmental and Social Risk Management (ESRM), International Finance Corporation, 2018
- Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, CSBSS, 2017
- WindFarmer Wind Farm Design course, Garrad Hassan, 2009
- Environmental Law Course, Aldo Leopold Institute, 2002
- Water Quality Management, Potchefstroom University, 1998

Professional Society Affiliations:

- Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: Environmental Science (400106/99)
- Registered with the International Associated for Impact Assessment South Africa (IAIAsa): 5888

Other Relevant Skills:

- Xtrack Extreme – Advanced Off-Road Driving Course (2003)

EMPLOYMENT

Date	Company	Roles and Responsibilities
2006 - Current:	Savannah Environmental (Pty) Ltd	Director <i>Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor</i>
1997 – 2005:	Bohlweki Environmental (Pty) Ltd	Associate <i>Environmental Management Unit: Manager; Principle Environmental Scientist focussing on Environmental Management and Project Management</i>

PROJECT EXPERIENCE

Experience includes projects associated with 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
Aggeneys PV Plant, Northern Cape	Solar Capital	Project Manager & EAP
Blackwood PV SEF, Free State	VentuSA Energy	Project Manager & EAP
Bloemsmond PV 1 & PV 2 SEF's, Northern Cape	Atlantic Energy Partners	Project Manager & EAP
Bosjesmansberg PV SEF, Northern Cape	Networx	Project Manager & EAP
Boundary PV SEF, Northern Cape	VentuSA Energy	Project Manager & EAP
Buffels PV 1 & PV 2 SEF's, North West	Kabi Energy	Project Manager & EAP
De Aar PV SEF, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
De Aar PV Solar Energy Plant, Northern Cape	Solar Capital	Project Manager & EAP
Gihon & Kison PV SEF's, Limpopo	Networx	Project Manager & EAP
Gunstfontein PV SEF, Northern Cape	Networx / Prana Energy	Project Manager & EAP
Harmony Eland, Nyala & Tshepong PV SEF's, Free State	BEEEntropie Renewable Innovation	Project Manager & EAP
Hibernia SEF, North West	EA Energy	Project Manager & EAP
Iziko PV SEF, Mpumalanga	VentuSA Energy	Project Manager & EAP
Kabi Kimberley PV Facility at DeBeers, Northern Cape	Kabi Solar	Project Manager & EAP
Karoo Renewables PV SEF, Northern Cape	SARGE	Project Manager & EAP
Kheis Phase 1, 2 & 3 PV SEF, Northern Cape	GeStamp Solar	Project Manager & EAP
Klipgat PV SEF, Northern Cape	Terra Solar	Project Manager & EAP
Loeriesfontein/Helios PV SEF, Northern Cape	Solar Capital	Project Manager & EAP
Naauwpoort PV SEF, Northern Cape	Terra Solar	Project Manager & EAP
Orkney PV SEF, North West	Genesis Eco-Energy	Project Manager & EAP
Pofadder SEF, Northern Cape	Mainstream Renewable	Project Manager & EAP
Prieska North PV SEF, Northern Cape	VentuSA Energy	Project Manager & EAP
Prieska PV SEF, Northern Cape	VentuSA Energy	Project Manager & EAP
Ritchie PV SEF, Northern Cape	Solar Capital	Project Manager & EAP
San Solar PV SEF, Northern Cape	VentuSA Energy	Project Manager & EAP
Sirius (Tungston Lodge) PV Solar Plants (x2, Northern Cape)	Aurora Power Solutions	Project Manager & EAP
Sol Invictus x4 PV Developments, Northern Cape	Building Energy	Project Manager & EAP
Solar Plant at Kathu (Wincanton), Northern Cape	REISA	Project Manager & EAP
Solar Plant at Sishen (Wincanton), Northern Cape	VentuSA Energy	Project Manager & EAP
Solar Plant at Sishen (Wincanton), Northern Cape	VentuSA Energy	Project Manager & EAP
SolarReserve Kotulo Tsatsi PV1 SEF, Northern Cape	Kotulo Tsatsi Energy and SolarReserve South Africa	Project Manager & EAP
SolarReserve Kotulo Tsatsi PV2 Facility, Northern Cape province	Kotulo Tsatsi Energy and SolarReserve South Africa	Project Manager & EAP
Stormberg Solar PV SEF, Eastern Cape	Networx / Prana Energy	Project Manager & EAP
Tewa Isitha (Grootdrink/Albany) PV SEF, Northern Cape	Africoast Engineers	Project Manager & EAP

Project Name & Location	Client Name	Role
Tiger Kloof PV SEF near Vryburg, North West	Kabi Energy	Project Manager & EAP
Tiger Solar PV SEF, Northern Cape	Kabi Energy	Project Manager & EAP
Vaalkop and Witkop PV SEF's, North West	Kabi Solar	Project Manager & EAP
Wagnbietjiespan PV SEF, Free State	VentuSA	Project Manager & EAP
Wolmaransstad Municipality PV SEF, North West	BlueWave	Project Manager & EAP
Woodhouse PV 1 & PV 2 SEF's, North West	Genesis Eco-Energy	Project Manager & EAP
Zuurwater PV SEF's (x4), Northern Cape	Solafrica / BlueWave	Project Manager & EAP
Three PV SEF facilities in Lichtenburg, North West	Atlantic Energy Partners	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Amandla Welanga & Dida PV SEF's near Noupoot, Northern Cape	Terra Solar	Project Manager & EAP
Carolusberg PV SEF, Northern Cape	Ilio Energy (SARGE)	Project Manager & EAP
Gosforth Park and Kynoch Rooftop PV SEF's Northern Cape	Building Energy	Project Manager & EAP
Hennenman PV SEF, Free State	BlueWave	Project Manager & EAP
Hibernia PV SEF near Lichtenburg, North West	EA Energy	Project Manager & EAP
Inkulukelo PV SEF, Northern Cape	Terra Solar	Project Manager & EAP
Kabi Kimberley PV SEF, Northern Cape	Kabi Energy	Project Manager & EAP
Kokerboom & Boabab PV Solar Energy Plants, Northern Cape	Brax Energy	Project Manager & EAP
Middelburg PV SEF, Mpumalanga	African Clean Energy Developments (ACED)	Project Manager & EAP
Nigramoep PV Solar Energy Plant, Northern Cape	SARGE	Project Manager & EAP
Noupoot (Kleinfontein and Toitdale) CPV, Northern Cape	Terra Power	Project Manager & EAP
O'Kiep 1 PV Solar Energy Plant, Northern Cape	Ilio Energy (SARGE)	Project Manager & EAP
O'Kiep 2 PV Solar Energy Plant, Northern Cape	BluePort Trade 118 (SARGE)	Project Manager & EAP
O'Kiep 3 PV Solar Energy Plant, Northern Cape	Ilio Energy (SARGE)	Project Manager & EAP
Rodicon PV SEF, Mpumalanga	VentuSA Energy	
Slurry PV SEF, North West	PPC	Project Manager & EAP
Small projects for PV SEF's, North West	BlueWave	Project Manager & EAP
Son Sitrus Rooftop PV Installation, Eastern Cape	Building Energy	Project Manager & EAP
Tollie PV SEF, Northern Cape	Terra Solar	Project Manager & EAP
x2 Southern Farms PV Solar Energy Plants, Northern Cape	Southern Farms	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Allemans, Wonderheuwel, Damfontein & Dida PV SEF's, Northern Cape	Terra Solar	Project Manager & EAP
Amandla Welang, Gillmer & Inkululeko PV SEF's, Northern Cape	GeoSolar/ TerraSolar	Project Manager & EAP
Blouputs PV, Onseepkans PV, Hoogelegen PV & Boegoeberg PV projects, Northern Cape	Engineering Development Industrial Projects (EDIP)	Project Manager & EAP
Bobididi PV SEF, Limpopo	Root 60Four Energy	Project Manager & EAP
Boshof-Les Marais / Buitenfontein SEF, Free State	Bluewave Capital	Project Manager & EAP
Bosjesmansberg PV SEF, Northern Cape	Networx	Project Manager & EAP

Project Name & Location	Client Name	Role
Class 2 & Class 3 Road Networks in the vicinity of the proposed Tambo Springs Freight Hub, Gauteng	SMEC South Africa (on behalf of Gauteng Department of Roads & Transport)	Project Manager & EAP
Hibernia SEF, North West	EA Energy	Project Manager & EAP
Lephalale PV SEF, Limpopo	Exxaro	Project Manager & EAP
Prieska PV SEF, Northern Cape	Terra Solar	Project Manager & EAP
Proposed Solar Project near Hotazel, Northern Cape province	ABO Wind	Project Manager & EAP
Proposed Solar Project near Beaufort West, Western Cape	ABO Wind	Project Manager & EAP
Proposed Solar Project near Lichtenburg, North West province	ABO Wind	Project Manager & EAP
PV SEF's (x15) for the projects for the REIPP small scale BID, Nationwide	Building Energy	Project Manager & EAP
Senekal 1 & 2, Pongola & Newcastle PV SEF's, Kwa-Zulu-Natal	Building Energy	Project Manager & EAP
Small scale PV SEF project - 2nd Stage One	Bluewave Capital	Project Manager & EAP
Small scale PV SEF project - 2nd Stage One	Building Energy	Project Manager & EAP
Stella Helpmekaar SEF, North West	Bluewave Capital	Project Manager & EAP
Wolmaransstad Municipality SEF, North West	Bluewave Capital	Project Manager & EAP
Solar Project near Beaufort West, Western Cape	ABO Wind	Project Manager & EAP
Solar Project near Lichtenburg, Western Cape	ABO Wind	Project Manager & EAP
Solar Project near Hotazel, Western Cape	ABO Wind	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the Contraction of the De Aar & Prieska PV Facilities, Northern Cape	GeStamp	Project Manager
ECO for the Construction of the Kathu PV Facility, Northern Cape	REISA / Building Energy	Project Manager

Compliance Advice and ESAP Reporting

Project Name & Location	Client Name	Role
ACWA Power SolarReserve Redstone Solar Plant, Northern Cape	SolarReserve	Environmental Advisor
Bokpoort PV SEF, Northern Cape	Solafrica	Environmental Advisor
Boshof PV SEF, Free State	BlueWave	Environmental Advisor
Hennenman PV SEF, Free State	BlueWave	Environmental Advisor
Kathu II SEF, Northern Cape	Building Energy	Environmental Advisor
Kathu PV SEF, Northern Cape	Building Energy / REISA	Environmental Advisor
Prieska PV SEF, Northern Cape	VentuSA	Environmental Advisor
San Solar SEF, Northern Cape	VentuSA / Acciona	Environmental Advisor
Sishen PV SEF Phase 1, Northern Cape	Aveng / Acciona	Environmental Advisor
Wolmaransstad Municipality Solar PV SEF, North West	BlueWave	Environmental Advisor
ESAP reporting for the operation phase of the Mulilo Solar PV De Aar and Mililo Solar PV Prieska	Mulilo and X-Elio	Environmental Advisor

Due Diligence Reporting

Project Name & Location	Client Name	Role
Kabi Kimberley PV Plant, Northern Cape	Enertis Solar	Environmental Advisor

Project Name & Location	Client Name	Role
Sishen Solar Farm, Northern Cape	Acciona (Windfall 59 Properties)	Environmental Advisor
Vaal River Solar 1 PV plant, North West	Enertis Solar	Environmental Advisor

Environmental Permitting & Water Use License (WUL) Applications

Project Name & Location	Client Name	Role
Permitting for the Kathu PV SEF, Northern Cape	Abengoa Solar	Project Manager & EAP
S53 application for Kabi Kimberley De Beers PV Plant, Northern Cape	Kabi Energy	Project Manager & EAP
S53 application for the Blackwood PV SEF, Free State	VentuSA Energy	Project Manager & EAP
S53 application for the Boundary PV SEF, Northern Cape	VentuSA Energy	Project Manager & EAP
S53 application for Vaalkop & Witkop PV SEF's, North West	Kabi Energy	Project Manager & EAP
S53 applications for various projects (Amandla Welang, Didar, Inkululeko, Kleinfontein, Klip Gat, Naau Poort, Toitdale & Tollie PV SEF's), Northern Cape	Terra Solar	Project Manager & EAP
WUL application for the Woodhouse PV1 & PV2 SEF's, North West	Genesis Eco-Energy	Project Manager & EAP

RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
De Aar CSP Energy facility, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Khi Solar One CSP facility, Northern Cape	Abengoa Solar	Project Manager & EAP
Noupoort CSP facility, Northern Cape	Cresco	Project Manager & EAP
Paulputs CSP facility, Northern Cape	Abengoa Solar	Project Manager & EAP
Pofadder & Upington CSP facilities, Northern Cape	Abengoa Solar	Project Manager & EAP
SolarReserve Kotulo Tsatsi CSP facility, Northern Cape province	SolarReserve	Project Manager & EAP
SolarReserve Kotulo Tsatsi CSP1 facility, Northern Cape	Kotulo Tsatsi Energy and SolarReserve South Africa	Project Manager & EAP
SolarReserve Kotulo Tsatsi CSP2 facility, Northern Cape	Kotulo Tsatsi Energy and SolarReserve South Africa	Project Manager & EAP
SolarReserve Kotulo Tsatsi CSP3 facility, Northern Cape	Kotulo Tsatsi Energy and SolarReserve South Africa	Project Manager & EAP
Upington 2 CSP facility, Northern Cape	Abengoa Solar	Project Manager & EAP
Upington 3 CSP facility, Northern Cape	Abengoa Solar	Project Manager & EAP
Xina Solar One CSP facility, Northern Cape	Abengoa Solar	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
KaXu Solar One facility, Northern Cape	Abengoa Solar	Project Manager
Khi Solar One facility, Northern Cape	Abengoa Solar	Project Manager
Xina Solar One facility, Northern Cape	Abengoa Solar	Project Manager

Screening Studies

Project Name & Location	Client Name	Role
Site Identification Tool for Proposed CSP Projects, Limpopo	Exxaro	Environmental Advisor

Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Kaxu Solar One CSP facility, Northern Cape	Abengoa Solar	Environmental Advisor
Khi Solar One CSP facility, Northern Cape	Abengoa Solar	Environmental Advisor
SolarReserve Kotulo Tsatsi CSP facility, Northern Cape province	SolarReserve	Environmental Advisor
Xina One CSP facility, Northern Cape	Abengoa Solar	Environmental Advisor

RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
ABs WEF near Indwe, Eastern Cape	Rainmaker Energy	Project Manager & EAP
Amakhala Emoyeni WEF, Eastern Cape	Windlab Developments	Project Manager & EAP
Amatole (2 phases) WEF, Eastern Cape	Genesis ECO-Energy	Project Manager & EAP
Boulders Wind Farm, Western Cape	IPD Power	Project Manager & EAP
Britannia Bay WEF, Western Cape	Terra Power Solutions	Project Manager & EAP
Castle WEF in De Aar, Northern Cape	Juwi Renewable Energies	Project Manager & EAP
Cookhouse WEF, Eastern Cape	African Clean Energy Developments (ACED) & Tertia Waters	Project Manager & EAP
Deep River Wind Energy Facility, Eastern Cape	VentuSA Energy	Project Manager & EAP
Dorper Phase 1 WEF, Eastern Cape	Rainmaker Energy	Project Manager & EAP
Elliot WEF, Eastern Cape	Rainmaker Energy	Project Manager & EAP
Garob WEF, Northern Cape	Juwi Renewable Energies	Project Manager & EAP
Gouda WEF, Western Cape	VentuSA Energy	Project Manager & EAP
Great Karoo WEF, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Gunstfontein WEF, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Happy Valley WEF, Eastern Cape	REISA	Project Manager & EAP
Hidden Valley WEF, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Hopefield WEF, Western Cape	Umoya Energy	Project Manager & EAP
Karoo Renewable Energy Facility, Northern & Western Cape	SARGE	Project Manager & EAP
Karreebosch Wind Farm (Roggeveld Phase 2), Northern Cape & Western Cape	G7 Renewable Energies	Project Manager & EAP
Karusa Wind Farm, Northern Cape	African Clean Energy Development	Project Manager & EAP
Klipheuwel / Dassiesfontein WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Nojoli WEF, Eastern Cape	African Clean Energy Developments	Project Manager & EAP
Nxuba WEF, Eastern Cape	African Clean Energy Developments	Project Manager & EAP
Olifants River WEF, Western Cape	SARGE	Project Manager & EAP

Project Name & Location	Client Name	Role
Oyster Bay WEF, Eastern Cape	RES	Environmental Advisor
Pofadder x3 WEF's, Northern Cape	Mainstream Renewable	Project Manager & EAP
Project Blue WEF, Northern Cape	Windy World	Project Manager & EAP
Rheboksfontein WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Riverbank WEF near Wesley, Eastern Cape	Just Energy	Project Manager & EAP
Sere WEF, Western Cape	Eskom Generation	Project Manager & EAP
Soetwater Wind Farm, Northern Cape	African Clean Energy Development	Project Manager & EAP
Springfontein WEF, Northern Cape	Mainstream Renewable	Project Manager & EAP
Stormberg WEF, Eastern Cape	Networx / Prana Energy	Project Manager & EAP
Suurplaat WEF, Western & Northern Cape	Moyneg Energy	Project Manager & EAP
Uiekraal WEF, Western Cape	Crenergol	Project Manager & EAP
West Coast One WEF, Western Cape	Moyeng Energy	Project Manager & EAP
West Coast WEF, Western Cape	Exxaro	Project Manager & EAP
Zen WEF near Gouda, Western Cape	VentuSA Energy	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Britannia Bay Wind Monitoring Mast, Western Cape	Terra Power Solutions	Project Manager & EAP
Caledon, Worcester & Tulbach Wind Monitoring Masts, Western Cape	SAGIT	Project Manager & EAP
Deep River Wind monitoring Mast, Eastern Cape	VentuSA Energy	Project Manager & EAP
Denhami Wind Farm, Western Cape	Richard Young	Project Manager & EAP
Dorper, Abs & Dobos Wind Monitoring Masts, Eastern Cape	Rainmaker Energy	Project Manager & EAP
Hopefield Wind Monitoring Mast, Western Cape	Umoya Energy	Project Manager & EAP
Klawer Wind Energy Facility, Western Cape	Vendiwell	Project Manager & EAP
Klipheuwel / Dassiesfontein Wind Monitoring Mast, Western Cape	BioTherm Energy	Project Manager & EAP
Riverbank Wind Monitoring Mast, Eastern Cape	Just Energy	Project Manager & EAP
Wind Monitoring Masts near Suurplaat, Western Cape	Investec Bank	Project Manager & EAP
Wind Monitoring Masts on the West Coast & Darling, Western Cape	Investec Bank	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Cookhouse WEF, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
De Aar WEF, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Developments within identified areas in the Overberg, Western Cape	BioTherm Energy	Project Manager & EAP
Hopefield WEF, Western Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Juno WEF, Western Cape	AMDA Developments	Project Manager & EAP
Lambert's Bat WEF, Western Cape	Vaayu Energy SA	Project Manager & EAP
Prospect Sites for various WEF's	Thabo Consulting (on behalf of Eskom Holdings)	Project Manager & EAP
Struis Baai area WEF, Western Cape	Richards Young	Project Manager & EAP
Suurplaat WEF, Western Cape	Investec Bank	Project Manager & EAP
Theewaterskloof Municipality WEF, Western Cape	Theewaterskloof Municipality	Project Manager & EAP

Project Name & Location	Client Name	Role
WEF's on x2 site on the West Coast, Western Cape	Investec Bank	Project Manager & EAP
Various WEF's in the Western Cape	Department of Environmental Affairs & Development Planning (DEA&DP)	Project Manager & EAP
Van Reenens WEF, Kwa-Zulu Natal & Free State	4GREEN Development Africa	Project Manager & EAP
WEF Development within the Sandveld area, Western Cape	Kovacs Investments (Nick Prium)	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the Construction of the Dorper Phase 1 WEF, Eastern Cape	Rainmaker Energy	Project Manager
ECO for the Construction of the Gouda Wind Farm, Western Cape	Blue Falcon Trading	Project Manager
EO for the Construction of the Dassiesklip WEF, Western Cape	Group Five	Project Manager

Compliance Advice & ESAP Reporting

Project Name & Location	Client Name	Role
Amakhala Emoyeni WEF, Eastern Cape	Windlab Developments	Environmental Advisor
Cookhouse II WEF, Eastern Cape	African Clean Energy Developments	Environmental Advisor
Cookhouse WEF, Eastern Cape	African Clean Energy Developments	Environmental Advisor
Dorper Phase 1 WEF, Eastern Cape	Rainmaker Energy	Environmental Advisor
Garob WEF, Northern Cape	Juwi Renewable Energies	Environmental Advisor
Gouda WEF, Western Cape	Aveng / Acciona	Environmental Advisor
Happy Valley WEF, Eastern Cape	VentuSA Energy / EDPR	Environmental Advisor
Hidden Valley WEF, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Hopefield WEF, Western Cape	Umoya Energy	Environmental Advisor
Karusa Wind Farm, Northern Cape	African Clean Energy Development	Environmental Advisor
Loperberg WEF, Eastern Cape	Rainmaker Energy	Environmental Advisor
Nobelsfontein WEF, Northern Cape	Coria / SARGE	Environmental Advisor
Nojoli WEF , Eastern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Nxuba WEF , Eastern Cape	African Clean Energy Developments	Environmental Advisor
Oyster Bay WEF, Eastern Cape	RES	Environmental Advisor
Riverbank Wind WEF, Eastern Cape	InnoWind	Environmental Advisor
Roggeveld Phase 1 WEF, Northern Cape	Building Energy	Environmental Advisor
Soetwater Wind Farm, Northern Cape	African Clean Energy Development	Environmental Advisor
Springfontein WEF, Northern Cape	Mainstream Renewable	Environmental Advisor
Zen WEF, Western Cape	VentuSA Energy	Environmental Advisor

Due Diligence Reporting

Project Name & Location	Client Name	Role
Gouda WEF, Western Cape	Blue Falcon Trading	Environmental Advisor

Project Name & Location	Client Name	Role
Loeriesfontein, Khobab & Noupoort WEF's, Northern Cape	Actis	Environmental Advisor
Roggeveld Wind Farm, Northern Cape	Building Energy	Environmental Advisor

Environmental Permitting & WUL Applications

Project Name & Location	Client Name	Role
Permitting for the Cookhouse WEF, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Permitting for the Karusa Wind Farm, Northern Cape	African Clean Energy Development	Project Manager & EAP
Permitting for the Sere WEF, Western Cape	Eskom	Project Manager & EAP
Permitting for the Soetwater Wind Farm, Northern Cape	African Clean Energy Development	Project Manager & EAP
Permitting Riverbank WEF, Eastern Cape	Electrawinds	Project Manager & EAP
S24G for the Klipheuwel / Dassiesfontein WEF, Western Cape		Project Manager & EAP
S53 application for the Nxuba Wind Farm, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
S53 Application for the Zen WEF, Western Cape	VentuSA Energy	Project Manager & EAP
WUL application for the Oyster Bay WEF, Eastern Cape	RES	Project Manager & EAP

CONVENTIONAL POWER GENERATION PROJECTS (COAL)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
H2 Energy Power Station, Mpumalanga	H2 Energy	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Coal fired power station in the Bethal area, Mpumalanga	ISS Global	Project Manager & EAP
Indwe Power Station, Eastern Cape	IPSA	Project Manager & EAP
IPP Base Load Power Station Development in Lephalale, Limpopo	Exxaro	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ISO 14001:2015 Audit for the Hendrina Power Station, Mpumalanga	Eskom Holdings	Project Manager

CONVENTIONAL POWER GENERATION PROJECTS (GAS)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Ankerlig OCGT to CCGT Conversion project & the Transmission Power Line between Ankerlig and the Omega Substation, Western Cape	Eskom Generation	Project Manager & EAP
Gourikwa OCGT to CCGT Conversion project & the Transmission Power Line between Gourikwa and the Proteus Substation, Western Cape	Eskom Generation	Project Manager & EAP

Neopak Combined Heat and Power (CHP) Plant, Rosslyn, Gauteng	Neopak	Project Manager & EAP
Richards Bay Combined Cycle Gas Turbine (CCGT) Power Plant, Kwa-Zulu Natal	Eskom	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Environmental Analysis for gas transmission pipelines in the Clayville, Nigel, and Wadeville areas, Gauteng	Eskom Holdings	Project Manager

GRID INFRASTRUCTURE PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Kyalami/Midrand Substation and 3 Transmission Lines, Gauteng	Eskom Transmission	Project Manager & EAP
Steelpoort Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Amakhala Emoyeni Power Line & Kopleegte Substation, Eastern Cape	Cennergi	Project Manager & EAP
Bon Espirange Substation & Overhead Power Line for the Roggeveld Wind Farm, Northern Cape	Building Energy (G7 Renewable Energies)	Project Manager & EAP
Castle WEF Powerline, Northern Cape	Juwi Renewable Energies	Project Manager & EAP
Cuprum-Burchell; Burchell-Mooidraai Power Line, Northern Cape	Eskom	Project Manager & EAP
Expansion of the Komsberg Main Transmission Substation, Northern Cape	Enel Green Power	Project Manager & EAP
Garob-Kronos Power Line, Northern Cape	Juwi Renewable Energies	Project Manager & EAP
Golden Valley Dx-Poseidon Power Line Substation & Golden Valley-Kopleegte Power Line, Eastern Cape	BioTherm Energy	Project Manager & EAP
Gunstfontein Switching Station, Power Line & Ancillary Infrastructure, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Ilanga Lethemba-Hydra, Northern Cape	Solar Capital	Project Manager & EAP
Iziduli Emoyeni WEF on-site substation, Power Line & Switching station, Access Roads & Watercourse Crossings, Eastern Cape	Windlab	Project Manager & EAP
Khai-Ma WEF Power Line, Northern Cape	Mainstream Renewable	Project Manager & EAP
Korana WEF Power Line, Northern Cape	Mainstream Renewable	Project Manager & EAP
Korana SEF Power Line, Northern Cape	Mainstream Renewable	Project Manager & EAP
Nobelsfontein WEF Power Line & Substation, Northern Cape	Coria / SARGE	Project Manager & EAP
Nojoli WEF Substation & Power Line Grid Connection, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Olifantshoek Substation & Powerline, Northern Cape	Eskom Holdings	Project Manager & EAP
Poortjies WEF Power Line, Northern Cape	Mainstream Renewable	Project Manager & EAP
Power Line & Substation for the Blackwood WEF, Northern Cape	VentuSA Energy	Project Manager & EAP

Power Line & Substation for the Khobab WEF in Loeriesfontein, Northern Cape	Mainstream Renewable	Project Manager & EAP
Power Line Connecting the Sishen SEF to the Ferrum MTS-UMTU Klip Kop Power Line, Northern Cape	Acciona (Windfall 59 Properties)	Project Manager & EAP
Power Line for the Grid Connection of the 2 SEF's near Kath and Dibeng, Northern Cape	VentuSA Energy	Project Manager & EAP
Power Line for the Rhebokfontein WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Power Line from Aggeneys Solar One to Aggeneis MTS Substation, Northern Cape	BlueWave	Project Manager & EAP
Re-alignment of 3 Eskom Power Line Servitudes within the Hopefield WEF, Western Cape	Umoya Energy	Project Manager & EAP
Re-alignment of the Power Line & Watercourse Crossings for the Loeriesfontein 2 WEF, Northern Cape	Mainstream Renewable	Project Manager & EAP
Re-alignment of the Power Line from Loeriesfontein 1 WEF to the Helios Substation, Northern Cape	Mainstream Renewable	Project Manager & EAP
Re-alignment of the Power Line from Loeriesfontein 3 WEF to the Helios Substation, Northern Cape	Mainstream Renewable	Project Manager & EAP
Substation for the Aggeneys PV SEF, Northern Cape	BioTherm Energy	Project Manager & EAP
Substation, Power Line & Watercourse Crossings for the Springfontein WEF, Free State	Mainstream Renewable	Project Manager & EAP
Wesley-Peddie (Riverbank Phase 2) Power Line for the Uncedo Lwethu WEF, Eastern Cape	Just Energy	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
EO for the construction of the Neptune-Vuyani Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager

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

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Afguns Road Realignment Project, Limpopo	Eskom Holdings	Project Manager & EAP
Expansion of the existing Welgedacht Water Care Works, Gauteng	ERWAT	Project Manager & EAP
Industrial Metals Cluster, Northern Cape	Northern Cape Department of Economic Development and Tourism	Project Manager & EAP
Modification of the existing Hartebeestfontein Water Care Works, Gauteng	ERWAT	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
New Raw Water Reservoir & Pipeline for the Medupi Power Station, Limpopo	Eskom Holdings	Project Manager & EAP
Msenge Emoyeni WEF Watercourse Crossings, Eastern Cape	Windlab	Project Manager & EAP
Dilokong Transport Facility, Limpopo	South African National Roads Agency Limited (SANRAL)	Project Manager & EAP
Neopak Water Treatment Plant, Gauteng	Neopak	Project Manager & EAP

Project Name & Location	Client Name	Role
Realignment of MR73 Road for the Construction of the Paulputs CSP Facility, Northern Cape	Abengoa Solar	Project Manager & EAP
Biomass Storage Area in Support of the Mkuze Biomass Power Station, KwaZulu-Natal	Building Energy	Project Manager & EAP
Wastewater Dam & Pipeline in Support of the Mkuze Biomass Power Station, Kwa-Zulu Natal	Building Energy	Project Manager & EAP
Watercourse Crossings for the Klawer Wind Energy Facility, Western Cape	Vendiwell	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the Construction of the Tiffindell Ski Resort, Eastern Cape	Tiffindell Ski	ECO
ECO for the Distribution centre & warehouse at Lords View Industrial Estate, Gauteng	Oliver & Partners	Project Manager
ECO for the Upgrade of the Waterval Wastewater Treatment Works, Gauteng	BCP Palace (on behalf of ERWAT)	Project Manager

Compliance Advice and reporting

Project Name & Location	Client Name	Role
Mkuze Biomass Plant, Kwa-Zulu Natal	Building Energy	Environmental Advisor
Tiffindell Ski, Eastern Cape	Tiffindell Ski	Environmental Advisor

Environmental Permitting & WUL Applications

Project Name & Location	Client Name	Role
Permitting, S53 & WULA for the Mkuze Biomass Plant, Kwa-Zulu Natal	Building Energy	Project Manager & EAP
WULA for the Visserhok Waste Tyre Depot, Western Cape	REDISA	Project Manager & EAP
WULA for the Witbank Waste Tyre Depot, Mpumalanga	REDISA	Project Manager & EAP

MINING

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Compliance Audit for the Palesa Coal Mine WML, Mpumalanga province	HCI Coal	Project Manager
Compliance Audit Waste Use Licene for the Mbali Coal Mine, Mpumalanga province	HCI Coal	Project Manager

ENVIRONMENTAL MANAGEMENT TOOLS

Project Name & Location	Client Name	Role
Review the effectiveness *& efficiency of the environmental impact management (EIA) system in South Africa, and formulate an environmental impact management strategy and action plan	National Department of Environmental Affairs	Environmental Advisor
Drafting a Position Paper: Project Financing and Environmental Risk Management (considering IFC	Standard Bank Group	Environmental Advisor

Performance Standards & Equator Principles)		
EMP for the Phase 1 of the Elitheni Coal Mine Project, Eastern Cape	Elitheni Coal	Environmental Advisor
Gap Analysis of Environmental Management Systems (EMS) with ISO 14001:2004	Venture Diversified Products	Environmental Advisor
Development of Provincial Guidelines for 4x4 routes	Western Cape Department of Environmental Affairs & Development Planning	Environmental Advisor
Permitting Study on the Status of Renewable Energy Projects in South Africa	E.ON	Environmental Advisor
Practical review of EGI SEA	CSIR	Environmental Advisor
Development & Implementation of the Environmental Management Systems (EMS) with ISO 14001:2004 for the UBS Office in Sandton, Gauteng	UBS AG	Environmental Advisor
Resource & Efficiency Plans for the operation phase of the Mulilo Solar PV De Aar and Mililo Solar PV Prieska	Mulilo and X-Elio	Environmental Advisor

TRAINING

Project Name & Location	Client Name	Role
Hendrina Power Station Environmental Law Training	Eskom Holding	Project Manager
Radar Training for NCC Biologists	EchoTracks	Project Manager

CURRICULUM VITAE OF JANA DE JAGER

Profession :	Environmental Assessment Practitioner
Specialisation:	Environmental Assessments, report writing, and GIS
Work Experience:	3.5 years' experience in Environmental Assessments & GIS

VOCATIONAL EXPERIENCE

Professional execution of consulting services for projects in the environmental management field, specialising in Environmental Impact Assessments, GIS mapping and screening assessments water use authorisations and assessments, environmental permitting, public participation, compilation of Environmental Management Plans and Programmes, and integrated environmental management. Responsibilities include report writing, compilation of project specific mapping, project management, review of specialist studies and the identification and assessment of potential negative environmental impacts and benefits. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Experience in conducting environmental impact assessments for energy developments, industrial manufacturing projects (asphalt plants), waste treatment projects (HCRW), and water use licensing for Mixed-Use Developments.

SKILLS BASE AND CORE COMPETENCIES

- Compilation of environmental impact assessment reports and environmental management programmes in accordance with relevant environmental legislative requirements;
- GIS analysis and mapping as per project specifications

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons) Environmental Science & Geography (2017), University of Pretoria (UP)
- B.Sc. Environmental Science (2016), University of Pretoria (UP)

Short Courses:

- Beginning Project Management: Project Management Level 1 (2020) – Joseph Phillips (Udemy)
- CBSS Water Governance Training Course (2019) – Carin Bosman, Water use governance Specialist
- Environmental Law Update Workshop (2018) – IMBEWU Sustainability Legal Specialists
- Official DWS Section 21 (c) and (i) Water Use Authorisation Course (2018)- Dr Wietsche Roets, Specialist Scientist: (In Stream Water Use);

Professional Society Affiliations:

- South African Council for Natural Scientific Professionals - Candidate Natural Scientist: Environmental Scientist – Reg No. 120039

Other Relevant Skills:

- Water Use Licensing on EWULAAS
- Compiling project budgets and proposals

EMPLOYMENT

Date	Company	Roles and Responsibilities
01 September 2020 - Current:	Savannah Environmental (Pty) Ltd	<i>Environmental Assessment Practitioner & GIS Consultant</i> <u>Tasks include:</u> <i>Compilation of Environmental Impact Assessment (EIA) reports; Basic Assessment (BA) reports and Environmental Management Programmes; Environmental Screening reports; GIS mapping; Co-ordination of the public participation process; Project management; project proposals and tenders; Client liaison and Marketing; Process EIA Applications.</i>
16 January 2018 – 29 August 2020	AquaEco	<i>Junior Environmental Consultant</i> <u>Tasks included:</u> <i>Drafting Environmental Applications; Basic Assessment & Environmental Impact Assessment Reports, and EMPr for review; assisting in environmental audits. Public participation liaison. Loading Water Use Licence information onto E-WUULAS system</i>

PROJECT EXPERIENCE

Jana has experience in conducting environmental impact assessments for industrial manufacturing projects (asphalt plants), waste treatment projects (HCRW), and water use licensing for Mixed-Use Developments. She has gained the ability to conduct project specific mapping and GIS analysis.

RENEWABLE ENERGY PROJECTS

Basic Assessments

Project Name & Location	Client Name	Role
Establishment of various infrastructure at the Msenge Emoyeni WEF	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Junior EAP GIS
132kV Transmission's infrastructure for the 320MW RMPP, Richards Bay, KwaZulu Natal	Phinda Power Producers (Pty) Ltd	Junior EAP GIS
132kV power line for Hyperion Hybrid Facility	Hyperion Solar Hybrid (Pty) Ltd	Junior EAP (Principal author) GIS
Grid Connection Infrastructure for the Frontier Power Gas to Power Plant, Saldanha Bay.	Frontier Power (Pty) Ltd	Junior EAP (Principal author) GIS
Roggeveld Wind Farm Access Road	Roggeveld Wind Power (Pty) Ltd	Junior EAP (Principal author) GIS

Environmental Impact Assessments

Project Name & Location	Client Name	Role
320MW Risk Mitigation Power Plant, Richards Bay, KwaZulu Natal	Phinda Power Producers (Pty) Ltd	Junior EAP (Principal author) GIS
Hyperion Hybrid Power Plant, Northern Cape	Hyperion Solar Hybrid (Pty) Ltd	Junior EAP (Principal author) GIS
Kotulo Tsatsi Energy PVI, Northern Cape Province	Kotulo Tsatsi Energy (Pty) Ltd	Junior EAP (Principal author) GIS

EA Amendments (Part 2)

Project Name & Location	Client Name	Role
Part 2 Amendment for the Namas and Zonnequa Wind Farms Grid Connection Infrastructure	Namas Wind (Pty)Ltd	Junior EAP (Principal author) GIS

Screening Assessments

Project Name & Location	Client Name	Role
Environmental Feasibility Screening Assessment for the Vogelstruis Renewable Energy Development, Vredendal, Western Cape	ABO Wind (Pty) Ltd	Principal author GIS
Environmental Feasibility Screening Assessment for the Kheis and Danielskuil Renewable Energy Developments, Northern Cape	AGV Projects (Pty) Ltd	Principal author GIS

OTHER SECTORS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
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Atholl Square Construction Environmental Management Programme	PIC	EMPr Author
Roadspan Asphalt Plant, Belfast, Mpumalanga	Roadspan Surfaces	Junior EAP
Rooiberg Asphalt Plant, Pretoria Gauteng	Rooiberg Asphalt	Junior EAP

Basic Assessments

Project Name & Location	Client Name	Role
Buhle Waste HCRW Treatment Plant	Buhle Waste	Junior EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
TRAC N4 Toll Route Annual Audit	TRAC N4	Assistant Auditor
TRAC N4 Toll Route Annual Water Sampling	TRAC N4	ECO

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

Project Name & Location	Client Name	Role
Midrand Aquaculture Facility GEMF Registration	Private	Junior EAP
Kapama Game Reserve – WULA	Kapama Game Reserve	Junior EAP
Marataba Safari Lodge – WULA	Marataba Safari Lodge	Junior EAP
Lapalala Game Reserve – GA registration	Lapalala Game Reserve	Junior EAP
Ngwenya Lodge – WULA	Ngwenya Lodge	Junior EAP

CURRICULUM VITAE OF NICOLENE VENTER

Profession :	Public Participation and Social Consultant
Specialisation:	Public participation process; stakeholder engagement; facilitation (workshops, focus group and public meetings; public open days; steering committees); monitoring and evaluation of public participation and stakeholder engagement processes
Work Experience:	23 years' experience as a Public Participation Practitioner and Stakeholder Consultant

VOCATIONAL EXPERIENCE

Over the past 23 years Nicolene established herself as an experienced and well recognised public participation practitioner, facilitator and strategic reviewer of public participation processes. She has experience in managing public participation and stakeholder engagement projects and awareness creation programmes. Her experience includes designing and managing countrywide public participation and stakeholder engagement projects and awareness creation projects, managing multi-project schedules, budgets and achieving project goals. She has successfully undertaken several public participation processes for EIA, BA and WULA projects. The EIA and BA process include linear projects such as the NMPP, Eskom Transmission and Distribution power lines as well as site specific developments such as renewable energy projects i.e. solar, photo voltaic and wind farms. She also successfully managed stakeholder engagement projects which were required to be in line with the Equator Principles, locally and in neighbouring countries.

SKILLS BASE AND CORE COMPETENCIES

- Project Management
- Public Participation, Stakeholder Engagement and Awareness Creation
- Public Speaking and Presentation Skills
- Facilitation (workshops, focus group meetings, public meetings, public open days, working groups and committees)
- Social Assessments (Stakeholder Analysis / Stakeholder Mapping)
- Monitoring and Evaluation of Public Participation and Stakeholder Engagement Processes
- Community Liaison
- IFC Performance Standards
- Equator Principles
- Minute taking, issues mapping, report writing and quality control

EDUCATION AND PROFESSIONAL STATUS

Degrees / Diplomas / Certificates:

- Higher Secretarial Certificate, Pretoria Technicon (1970)

Short Courses:

- Techniques for Effective Public Participation, International Association for Public Participation, IAP2 (2008)
- Foundations of Public Participation (Planning and Communication for Effective Public Participation), IAP2 (2009)
- Certificate in Public Participation – IAP2SA Modules 1, 2 and 3 (2013)

Certificate in Public Relations, Public Relation Institute of South Africa, Damelin Management School (1989)

Professional Society Affiliations:

- Member of International Association for Public Participation (IAP2): Southern Africa

EMPLOYMENT

Date	Company	Roles and Responsibilities
November 2018 – current	Savannah Environmental (Pty) Ltd	<p>Public Participation and Social Consultant</p> <p><i>Tasks include:</i></p> <p><i>Tasks include: Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.</i></p> <p><i>Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved.</i></p>

Date	Company	Roles and Responsibilities
2016 – October 2018	Imaginative Africa (Pty) Ltd <i>(Director of Imaginative Africa)</i>	Independent Consultant Consulting to various Environmental Assessment Practitioners for Public Participation and Stakeholder Engagements: <u>Tasks include:</u> Tasks include: Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc. Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved <u>Clients:</u> SiVEST Environmental Savannah Environmental Baagi Environmental Royal Haskoning DHV (previously SSI)
2013 - 2016	Zitholele Consulting Contact person: Dr Mathys Vosloo Contact number: 011 207 2060	Senior Public Participation Practitioner and Project Manager <u>Tasks included:</u> Project managed public participation process for EIA/BA/WULA/EAL projects. Manages two Public Participation Administrators. Public Participation tasks as outlined as above and including financial management of public participation processes.
2011 - 2013	Imaginative Africa (Pty) Ltd <i>(company owned by Nicolene Venter)</i>	Independent Consultant Consulting to various Environmental Assessment Practitioners for Public Participation and Stakeholder Engagements <u>Tasks included:</u> Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document,

		<p>Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.</p> <p>Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved</p> <p><u>Clients:</u> Bohlweki Environmental Bembani Sustainability (Pty) Ltd Naledzi Environmental</p>
2007 – 2011	SiVEST SA (Pty) Ltd Contact person: Andrea Gibb Contact number: 011 798 0600	Unit Manager: Public Participation Practitioner <u>Tasks included:</u> Project managed public participation process for EIA/BA projects. Manages two Junior Public Participation Practitioners. Public Participation tasks as outlined as above and including financial management of public participation processes.
2005 – 2006	Imaginative Africa (Pty) Ltd (company owned by Nicolene Venter)	Independent Consultant Public Participation and Stakeholder Engagement Practitioner <u>Tasks included:</u> Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc. Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical

		<p>information communicated to and consultation with all level of stakeholders involved.</p> <p><u>Clients:</u></p> <p>Manyaka-Greyling-Meiring (previously Greyling Liaison and currently Golder Associates)</p>
<p>1997 - 2004</p>	<p>Imaginative Africa (Pty) Ltd (company owned by Nicolene Venter)</p>	<p>Independent Consultant: Public Participation Practitioner.</p> <p><u>Tasks included:</u></p> <p>Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, affected landowners, etc.</p> <p>Managing interaction between Stakeholders and Team Members, liaising with National, Provincial Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved.</p> <p><u>Clients:</u></p> <p>Greyling Liaison (currently Golder Associates); Bemani Sustainability (Pty) Ltd; Lidwala Environmental; Naledzi Environmental</p>

PROJECT EXPERIENCE

RENEWABLE POWER GENERATION PROJECTS

PHOTOVOLTAIC SOLAR ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Lichtenburg PVs (3 PVs) & Power Lines (grid connection), Lichtenburg, North West Province	Atlantic Energy Partners EAP: Savannah Environmental	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Allepad PVs 4 PVs) & Power Lines (grid connection), Upington, Northern Cape Province	IL Energy EAP: Savannah Environmental	
Hyperion Solar PV Developments (4 PVs) and Associated Infrastructures, Kathu, Northern Cape Province	Building Energy EAP: Savannah Environmental	
Aggeneys Solar PV Developments (2 PVs) and Associated Infrastructures, Aggeneys, Northern Cape Province	Atlantic Energy Partners and ABO Wind EAP: Savannah Environmental	
Upilanga Solar Park, Northern Cape (350MW CSP Tower)	Emvelo Capital Projects (Pty) Ltd	
Khunab Solar Development, consisting of Klip Punt PV1, McTaggarts PV1, McTaggarts PV2, McTaggarts PV3 and the Khunab solar Grid Connection near Upington, Northern Cape Province	Atlantic Energy Partners and Abengoa	
Sirius Solar PV3 and PV4, near Upington, Northern Cape Province	Solal	
Geelster PV 1 and PV2 solar energy facilities, near Aggeneys, Northern Cape	ABO Wind	
Naledi PV and Ngwedi PV solar energy facilities, near Upington, Northern Cape	Atlantic Energy Partners and Abengoa	
Kotulo Tsatsi PV1, Kotulo Tsatsi PV3 and Kotulo Tsatsi PV4 solar energy facilities, near Kenhardt, Northern Cape	Kotulo Tsatsi Energy	
Thlitseng PV, including Substations & Power Lines, Lichtenburg, North West Province	BioTherm Energy EAP: SiVEST	Public Participation, Landowner and Community Consultation
Sendawo PVs, including Substations & Power Lines, Vryburg, North West Province		
Helena Solar 1, 2 and 3 PVs, Copperton, Northern Cape Province		
Farm Spes Bona 23552 Solar PV Plants, Bloemfontein, Free State Province	Surya Power EAP: SiVEST	Public Participation, Landowner and Community Consultation
De Aar Solar Energy Facility, De Aar, Northern Cape Province	South Africa Mainstream Renewable Power Developments EAP: SiVEST	Public Participation, Landowner and Community Consultation
Droogfontein Solar Energy Facility, Kimberley, Northern Cape Province		
Kaalspruit Solar Energy Facility, Loeriesfontein, Northern Cape Province		

Platsjambok East PV, Prieska, Northern Cape Province		
Renosterburg PV, De Aar, Northern Cape Province	Renosterberg Wind Energy Company EAP: SiVEST	Public Participation, Landowner and Community Consultation
19MW Solar Power Plant on Farm 198 (Slypklip), Danielskuil, Northern Cape Province	Solar Reserve South Africa EAP: SiVEST	Public Participation, Landowner and Community Consultation

Basic Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Upilanga Solar Park, Northern Cape (x6 100MW PV's and x3 350MW PV Basic Assessments)	Emvelo Capital Projects (Pty) Ltd	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Sirius Solar PV Solar Energy Facility, Upington, Northern Cape Province	SOLA Future Energy	
Khunab Solar Development, consisting of Klip Punt PV1, McTaggart PV1, McTaggart PV2, McTaggart PV3 and the Khunab solar Grid Connection near Upington, Northern Cape Province	Atlantic Energy Partners and Abengoa	

WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Aletta Wind Farm, Copperton, Northern Cape Province	BioTherm Energy EAP: SiVEST	Public Participation
Eureka Wind Farm, Copperton, Northern Cape Province		
Loeriesfontein Wind Farm, Loeriesfontein, Northern Cape Province	South Africa Mainstream Renewable Power Developments EAP: SiVEST	Public Participation
Droogfontein Wind Farm, Loeriesfontein, Northern Cape Province		
Four Leeuwberg Wind Farms, Loeriesfontein, Northern Cape Province		
Noupoort Wind Farm, Noupoort, Northern Cape Province		
Mierdam PV & Wind Farm, Prieska, Northern Cape Province		
Platsjambok West Wind Farm & PV, Prieska, Northern Cape Province		

Basic Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Cluster of Renewable Energy Developments, Eastern Cape Province	Wind Relic	

Nama Wind Energy Facility, Northern Cape Province	Genesis ECO EAP: Savannah Environmental	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Zonnequa Wind Energy Facility, Northern Cape Province		

CONCENTRATED SOLAR FACILITIES (CSP)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Upington Concentrating Solar Plant and associated Infrastructures, Northern Cape Province	Eskom Holdings EAP: Bohlweki Environmental	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders

CONVENTIONAL POWER GENERATION PROJECTS (GAS)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
450MW gas to power project and associated 132kV power line, Richards bay, KwaZulu-Natal	Phinda Power Producers	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders & Landowners
4000MW gas to power project and associated 400kV power lines, Richards bay, KwaZulu-Natal	Phinda Power Producers	
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	

GRID INFRASTRUCTURE PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
132/11kV Olifantshoek Substation and Power Line, Northern Cape	Eskom	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Grid connection infrastructure for the Namas Wind Farm, Northern Cape Province	Genesis Namas Wind (Pty) Ltd	
Grid connection infrastructure for the Zonnequa Wind Farm, Northern Cape Province	Genesis Zonnequa Wind (Pty) Ltd	
Khunab Solar Grid Connection, near Upington, Northern Cape Province	Atlantic Energy Partners and Abengoa	
Pluto-Mahikeng Main Transmission Substation and 400kV Power Line (Carletonville to Mahikeng), Gauteng and North West Provinces	Eskom Holdings EAP: Baagi Environmental	
Thyspunt Transmission Lines Integration Project, Eastern Cape Province	Eskom Holdings EAP: SIVEST	
Westrand Strengthening Project, Gauteng Province		Public Participation,

Mookodi Integration Project, North-West Province		
Transnet Coallink, Mpumalanga and KwaZulu-Natal Provinces		
Delarey-Kopela-Phahameng Distribution power line and newly proposed Substations, North-West Province		Public Participation, Landowner and Community Consultation
Invubu-Theta 400kV Eskom Transmission Power Line, KwaZulu-Natal Province	Eskom Holding EAP: Bemani Environmental	
Melkhout-Kudu-Grassridge 132kV Power Line Project (project not submitted to DEA), Eastern Cape Province	Eskom Holdings EAP: SIVEST	Public Participation, Landowner and Community Consultation
Tweespruit-Welroux-Driedorp-Wepener 132Kv Power Line, Free State Province		
Kuruman 132Kv Power Line Upgrade, Northern Cape Province	Eskom Holdings EAP: Zitholele	
Vaalbank 132Kv Power Line, Free State Province		
Pongola-Candover-Golela 132kV Power Line (Impact Phase), KwaZulu-Natal Province		

PART 2 AMENDMENTS

Project Name & Location	Client Name	Role
Transalloys Coal-Fired Power Station near Emalahleni, Mpumalanga Province	Transalloys (Pty) Ltd	Project Manage the Public Participation Process
Zen Wind Energy Facility, Western Cape	Energy Team (Pty) Ltd	
Hartebeest Wind Energy Facility, Western Cape	juwi Renewable Energies (Pty) Ltd	
Khai-Ma and Korana Wind Energy Facilities	Mainstream Renewable Power (Pty) Ltd	

FACILITATION

Project Name & Location	Client Name	Meeting Type
Bloemfontein Strengthening Project, Free State Province	Eskom Holdings EAP: Baagi Environmental	Public Meetings
Moodraai-Smitkloof 132kV Power Line and Substation, Northern Cape Province	Eskom Holdings EAP: SSI	Focus Group Meetings
Aggeneis-Oranjemond 400kV Eskom Transmission Power Line, Northern Cape Province	Eskom Holdings EAP: Savannah Environmental	Focus Group Meetings & Public Meetings
Ariadne-Eros 400kV/132kV Multi-Circuit Transmission Power Line (Public Meetings)	Eskom Holdings EAP: ACER Africa	Public Meetings
Majuba-Venus 765kV Transmission Power Lines, Mpumalanga Province		
Thabametsi IPP Power Station, Limpopo Province	Thabametsi Power Company EAP: Savannah Environmental	Focus Group Meeting & Public Meeting
Aggeneis-Oranjemond Transmission Line & Substation Upgrade, Northern Cape	Eskom Transmission	Focus Group Meetings & Public Meetings

SCREENING STUDIES

Project Name & Location	Client Name	Role
Potential Power Line Alternatives from Humansdorp to Port Elizabeth, Eastern Cape Province	Nelson Mandela Bay Municipality EAP: SiVEST	Social Assessment

ASH DISPOSAL FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Medupi Flue Gas Desulphurisation Project (up to completion of Scoping Phase), Limpopo Province	Eskom Holdings SOC Ltd EAP: Zitholele Consulting	Public Participation, Landowner and Community Consultation
Kendal 30-year Ash Disposal Facility, Mpumalanga Province		
Kusile 60-year Ash Disposal Facility, Mpumalanga Province		
Camden Power Station Ash Disposal Facility, Mpumalanga Province		
Tutuka Fabric Filter Retrofit and Dust Handling Plant Projects, Mpumalanga Province	Eskom Holdings SOC Ltd EAP: Lidwala Environmental	
Eskom's Majuba and Tutuka Ash Dump Expansion, Mpumalanga Province		
Hendrina Ash Dam Expansion, Mpumalanga Province		

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

Basic Assessments

Project Name & Location	Client Name	Role
Expansion of LOX and Diesel Storage at the Air Products Facility in Coega, Eastern Cape	Air Products South Africa (Pty) Ltd	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders & Landowners
Transnet's New Multi-Products Pipeline traversing Kwa-Zulu Natal, Free State and Gauteng Provinces	Transnet EAP: Bohlweki Environmental	
Realignment of the Bulshoek Dam Weir near Klaver and the Doring River Weir near Clanwilliam, Western Cape Province	Dept of Water and Sanitation EAP: Zitholele	Public Participation

STAKEHOLDER ENGAGEMENT

Project Name & Location	Client Name	Role
Socio-Economic Impact Study for the shutdown and repurposing of Eskom Power Stations: Komati Power Station, Hendrina Power Station & Grootvlei Power Station	Urban-Econ	Project Management for the stakeholder engagement with Community

		Representatives in the primary data capture area
First State of Waste Report for South Africa	Golder Associates on behalf of the Department of Environmental Affairs	Secretarial Services
Determination, Review and Implementation of the Reserve in the Olifants/Letaba System	Golder Associates on behalf of the Department of Water and Sanitation	
Orange River Bulk Water Supply System		
Levuvu-Letaba Resources Quality Objectives		

FACILITATION

Project Name & Location	Client Name	Meeting Type
Determination, Review and Implementation of the Reserve in the Olifants/Letaba System	Department of Water and Sanitation	Secretarial Services
Orange River Bulk Water Supply System	Golder Associates	Secretarial Services
Levuvu-Letaba Resources Quality Objectives		Secretarial Services
SmancorCR Chemical Plant (Public Meeting), Gauteng Province	Samancor Chrome (Pty) Ltd EAP: Environmental Science Associates	Public Meeting
SANRAL N4 Toll Highway Project (2 nd Phase), Gauteng & North West Provinces	Department of Transport EAP: Bohlweki Environmental	Public Meetings

MINING SECTOR

Environmental Impact Assessment and Environmental Management Programme

Project Name & Location	Client Name	Role
Zero Waste Recovery Plant at highveld Steel, Mpumalanga Province	Anglo African Metals EAP: Savannah Environmental	Public Participation
Koffiefontein Slimes Dam, Free State Province	Petra Diamond Mines EAP: Zitholele	Public Participation
Baobab Project: Ethenol Plant, Chimbanje, Middle Sabie, Zimbabwe	Applicant: Green Fuel EAP: SIVEST	Public Participation & Community Consultation
BHP Billiton Energy Coal SA's Middelburg Water Treatment Plant, Mpumalanga	BHP Billiton Group EAP: Jones & Wagener	Public Participation

ENVIRONMENTAL AUTHORISATION AMENDMENTS

Project Name & Location	Client Name	Role
Transalloys Coal-Fired Power Station near Emalahleni, Mpumalanga Province	Transalloys (Pty) Ltd	Public Participation
Zen Wind Energy Facility, Western Cape	Energy Team (Pty) Ltd	
Hartebeest Wind Energy Facility, Western Cape	juwi Renewable Energies (Pty) Ltd	
Khai-Ma and Korana Wind Energy Facilities	Mainstream Renewable Power (Pty) Ltd	
Beaufort West 280MW Wind Farm into two 140MW Trakas and Beaufort West Wind Farms, Western Cape	South Africa Mainstream Renewable Power Developments EAP: SIVEST	

SECTION 54 AUDITS

Project Name & Location	Client Name	Role
Mulilo 20MW PV Facility, Prieska, Northern Cape	Mulilo (Pty) Ltd	Public Participation: I&AP Notification process
Mulilo 10MW PV Facility, De Aar, Northern Cape	Mulilo (Pty) Ltd	
Karoshhoek CSP 1 Facility/ Solar One, Upington, Northern Cape	Karoshhoek Solar One (Pty) Ltd	

CURRICULUM VITAE OF RENDANI RASIVHETSHELE

Profession : Environmental Assessment Practitioner

Specialisation: Environmental Impacts Assessments, Report writing

Work Experience: 4 years' experience in Environmental Field

VOCATIONAL EXPERIENCE

Professional execution of consulting services for various projects in the environmental management field, specialising in Environmental Impact Assessments studies, environmental permitting, public participation process, compilation of environmental management plans and programmes. Responsibilities include report writing, project management and coordination, environmental planning, stakeholder engagements, site inspections, reviews of specialist studies and identifications of potential negative environmental impacts and benefits,

SKILLS BASE AND CORE COMPETENCIES

- Interpretation of environmental regulations and compilation of Environmental Impact Assessments reports and associated environmental management programmes in accordance with the relevant environmental legislative requirements.
- Project management for a variety of projects
- Public participation process for a variety of projects
- Environmental planning

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons) Environmental Management (2020), University of South Africa (UNISA)
- Bachelor of Environmental Science (2016), University of Venda (UNIVEN)

Short Courses:

- Introduction to SAMTRAC (2020) - NOSA
- Introduction to EIA Report Writing (2020) - IAIAsa

Professional Society Affiliations:

- Environmental Assessment Practitioners Association of South Africa – Reg. EAP(EAPASA)- Reg No. 2019/1729
- International Association for Impact Assessment South Africa – Full Member – Reg No. 6534
- South African Council for natural Scientific Professionals – Candidate Natural Scientist: Environmental Scientist – Reg No. 116712

EMPLOYMENT

Date	Company	Roles and Responsibilities
May 2021 - Current:	Savannah Environmental (Pty) Ltd	<i>Environmental Assessment Practitioner</i> <u>Tasks included:</u> Compilation of Environmental Impact Assessment (EIA) reports, Basic Assessment (BA) reports and Environmental Management Programmes (EMPr), environmental Screening reports, co-ordination of public participation process, Project management, Client liaison, Process EIA and amendments applications.
March 2021 – April 2021	JB Enviro Services (Pty) Ltd	<i>Environmental Control Officer</i> <u>Task included:</u> Maintaining the Environmental Management System to align with ISO14001 Standard, Conducting site visits and compiling site reports.
August 2018 – May 2020	LEAP Enviro (Imbrilinx cc)	<i>Environmental Assessment Practitioner</i> <u>Tasks included:</u> Compilation of Environmental Impact Assessment (EIA) reports, Basic Assessment (BA) reports and Environmental Management Programmes (EMPr), environmental Screening reports, co-ordination of public participation process, Project management, Client and specialist liaison, Process EIA and amendments applications.
April 2016- July 2018	Mott Macdonald SA (Pty) Ltd	<i>Assistant Environmental Consultant</i> <u>Tasks included:</u> Assisting with public participation processes, environmental assessments, basic mapping, and field work.

PROJECT EXPERIENCE

Experience in conducting Environmental Impacts Assessments, public participation, and Environmental Management Programme, for residential developments, commercial developments, industrial upgrades, bulk services, and renewable energy projects (solar and wind). Responsibilities includes overall compilation of the report, specialists engagements, reviewing specialists reports and incorporating specialist studies into the Environmental Impact Assessment report and its associated Environmental Management Programme.

INFRASTRUCTURE DEVELOPMENT PROJECTS (PIPELINES, WATER RESOURCES, INDUSTRIAL)

Basic Assessments and Environmental Programmes

Project Name & Location	Client Name	Role
Diepsloot Klevebank, Sewer upgrade, Gauteng	Johannesburg water	Project Manager & EAP
Olivedale retirement village, dam rehabilitation, Gauteng	Olivedale Retirement Village	Project Manager & EAP

HOUSING AND URBAN PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Helderwyk Integrated Residential Project, Gauteng	Purple Moss 19(Pty) Ltd	EAP
Reigerpark Extension 10 mixed use Development, Gauteng	Living Africa 2 (Pty) Ltd	EAP
Dersley Springs, Gauteng	Royal Albertos Properties	EAP
Alliance Extension 4 & 5, Gauteng	New Canada Developments	EAP

Basic Assessments and Environmental Programmes

Project Name & Location	Client Name	Role
Botesdal Commercial Development, Gauteng	Open Energy Innovations	Project Manager & EAP
Dark City/Poortjie Residential Development, Gauteng	City of Johannesburg	Project Manager & EAP
Matsamo Mall, Mpumalanga	Moolman Group	Project Manager & EAP
Clayville Extension 45 Mixed use development, Gauteng	Valuemax Midrand	EAP
Queenswood Extension 14, township establishment, Gauteng	Skilpadriff Ontwikkeling	EAP

RENEWABLE ENERGY PROJECTS

Basic Assessments

Project Name & Location	Client Name	Role
Redding Wind Energy Facility, Eastern Cape	Redding (Pty) Ltd	EAP
Aeolus Wind Energy Facility, Eastern Cape	Aeolus (Pty) Ltd	EAP
Woodhouse Grid Connection, North West	Genesis Eco Energy Developments	EAP

Part 2 amendments

Project Name & Location	Client Name	Role
Perdekraal West Wind Energy Facility, Western Cape	Biotherm	EAP
Poortjies Wind Energy Facility, Northern Cape	Mainstream	EAP
Loperberg Wind Energy Facility, Eastern Cape	Loperberg Wind Farm	EAP
Malabar Wind Energy Facility, Eastern Cape	Malabar Wind Farm	EAP
Spreeukloof Wind Energy Facility, Eastern Cape	Spreeukloof Wind Farm	EAP

Part 1 amendments

Project Name & Location	Client Name	Role
Woodhouse Solar 1 PV, North West	Genesis Woodhouse Solar 1	EAP

Woodhouse Solar 2 PV, North West	Genesis Woodhouse Solar 2	EAP
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OTHER PROJECTS

Basic Assessments

Project Name & Location	Client Name	Role
Thokoza Park, Gauteng	City of Ekurhuleni municipality	EAP
Macsteel, Industrial upgrade, Gauteng	The insulation Company	EAP

