



DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

for
THEMEDA PV
on

Portion 7 of the Farm Elandsfontein 34

In terms of the
National Environmental Management Act (Act No. 107 of 1998, as
amended) & 2014 Environmental Impact Regulations

Prepared for Applicant: Themeda PV (Pty) Ltd

Date: 15 August 2022

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PURPOSE OF THIS REPORT:

I&AP review and comment

APPLICANT:

Euphoria PV (Pty) Ltd

CAPE EAPRAC REFERENCE NO:

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EMPR LEGISLATIVE REQUIREMENTS

Appendix 4 of Regulation 982 of the 2014 EIA Regulations contains the required contents of an Environmental Management Programme (EMPr). The checklist below serves as a summary of how these requirements were incorporated into this EMPr.

Requirement	Description
<p>Details of the EAP who prepared the EMPr; and;</p> <p>The expertise of the EAP to prepare an EMPr, including a curriculum vitae.</p>	<p>This EMPr was prepared by Dale Holder of Cape EAPrac who has more than 18 years' experience as an Environmental Assessment Practitioner. The CV of the EAP is attached in appendix M.</p>
<p>A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.</p>	<p>This EMP covers all aspects of the project as currently proposed for the Themeda PV.</p> <ul style="list-style-type: none"> • PV modules and mounting structures; • Inverters and transformers; • Cabling; • Battery Energy Storage System (BESS); • Site and internal access roads (up to 8 m wide); • Auxiliary buildings (33 kV switch room, gatehouse and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.); • Perimeter fencing and security infrastructure; • Rainwater tanks; • Temporary and permanent laydown areas; • Facility substation.
<p>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</p>	<p>The Site Layout Plan (SLP) attached in Appendix A, includes the sensitive features identified by participating specialists and indicates how these have been incorporated.</p> <p>The "exclusion areas" identified on this SLP as well as all areas outside of the perimeter fencing of the facility are considered as no go areas for construction activities.</p>
<p>A description of the impact management objectives, 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 the phases of the development including –</p> <ul style="list-style-type: none"> (i) Planning and design; (ii) Pre-construction activities; (iii) Construction activities; (iv) Rehabilitation of the environment after construction and where applicable post closure; and (v) Where relevant, operation activities. 	<p>Sections 1.3</p>

Requirement	Description
A description and identification of impact management outcomes required for the aspects contemplated above.	Sections 4 -11
<p>A description of the proposed impact management actions, identifying the way the impact management objectives and outcomes contemplated above will be achieved and must, where applicable include actions to –</p> <ul style="list-style-type: none"> (i) Avoid, modify, remedy control or stop any action, activity or process which causes pollution or environmental degradation; (ii) Comply with any prescribed environmental management standards or practises; (iii) Comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable. 	Sections 4 – 11
The method of monitoring the implantation of the impact management actions contemplated above.	Sections 4 – 11 and section 14
The frequency of monitoring the implementation of the impact management actions contemplated above.	Sections 4 – 11 and section 14
An indication of the persons who will be responsible for the implementation of the impact management actions.	Sections 4 – 11
The time periods within which the impact management actions must be implemented.	Sections 4 – 11 and section 14
The mechanism for monitoring compliance with the impact management actions.	Section 2 and 4-11
A program for reporting on compliance, considering the requirements as prescribed in the Regulations.	Section 2
<p>An environmental awareness plan describing the way –</p> <ul style="list-style-type: none"> (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) Risks must be dealt with to avoid pollution or the degradation of the environment. 	Section 5.2
Any specific information that may be required by the competent authority.	None.

DFFE COMMENT ON EMPr

The competent authority will be provided with an opportunity to comment on this EMPr. This comment will be considered and the EMPr updated accordingly.

ENVIRONMENTAL MANAGEMENT PROGRAMME – THEMEDA PV

in terms of the

National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended & Environmental Impact Regulations 2014

THEMEDA PV

Portion 7 of the Farm Elandsfontein 34.

Submitted for:

Stakeholder Review & Comment

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ORDER OF REPORT

Environmental Management Programme – Main Report

- Appendix A** : Site Layout Plan – Themeda PV
- Appendix B** : DFFE Generic EMPr for sub-station infrastructure (DFFE, 2019)
- Appendix C** : Stormwater Management Plan (Sivest, 2022)
- Appendix D** : Transportation and Traffic Management Plan (Sivest, 2022)
- Appendix E** : Construction Method Statements (to be appended once approved by the ECO)
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EMPR THEMEDA PV

1. INTRODUCTION

Cape EAPrac has been appointed by the Applicant, Euphorbia PV (Pty) Ltd, as the independent **Environmental Assessment Practitioner (EAP)** responsible for compilation of the **Draft Environmental Management Programme (EMPr)** for the proposed Euphorbia PV.

The key purpose of this EMPr is to ensure that the remedial and mitigation requirements identified during the Basic Assessment Report are implemented during the lifespan of the project (design to decommissioning). The EMPr is thus a management tool used to minimise and mitigate the potential environmental impacts, while maximising the benefits.

A detailed description of the proposed project and a description of the affected environment are provided in the Environmental Impact Report (EIR) which should be referred to where necessary.

It is important that this EMPr be read in conjunction with the Generic EMPr for substation infrastructure included in Appendix B.

1.1 APPROACH TO THE EMPr

This EMPr addresses the environmental management of the four key phases of the project, namely:

- The design and pre-construction phase;
- The construction phase;
- The operation phase; and
- The closure and decommissioning phase.

1.1.1 Pre-construction Phase

The pre-construction phase of the development refers to the final layout design considerations and the site preparation (fine-scale design and placement, survey of development site and associated infrastructure, demarcation of no-go areas, establishment of site camp and laydown area, vegetation clearing for establishment of internal road network¹).

1.1.2 Construction Phase

The construction phase of the development refers to the earthworks and the actual construction of the civil works (installation of the PV panel arrays, construction of internal roads, stormwater structures and auxiliary buildings and on-site substation), as well as the external infrastructure such as MV cabling, access roads and gate house. The construction phase will start with the perimeter fencing of the facility and will end with final landscaping and re-vegetation / rehabilitation of the site and surrounding areas.

1.1.3 Operation Phase

The operational phase commences once the facility starts providing power into the electrical network (i.e., at Contractual Operation Date). There may be a stage where both construction and operation activities overlap i.e., occur on site at the same time. The operation phase included the monitoring and maintenance activities required for the efficient functioning of the facility (e.g., cleaning and repair of solar arrays, brush-cutting of vegetation etc.), as well as health and integrity of the surrounding environment (e.g., removal alien vegetation, management of erosion etc.).

• ¹ This activity is considered to form both part of the pre-construction and the construction phase

1.1.4 Closure and Decommissioning Phase

Closure and decommissioning refers to the decommissioning of the panel arrays at the end of their operational lifespan or at the end of the term of the Power Purchase Agreement (PPA). For this report, three possible scenarios are considered, namely:

- Continuation of operations under an extended PPA
- The re-use, repair &/ upgrade of the facility for alternative power generation;
- The total decommissioning of the solar facility.

1.2 PURPOSE

This EMPr is relevant to the Themeda PV renewable energy project, and all listed and specified activities necessary for the realisation of this project.

1.3 OBJECTIVE

The objective of this EMPr is to prescribe project specific and generally accepted impact management outcomes and impact management actions associated with the development of the Themeda PV and its associated infrastructure.

- To ensure the least possible impact to:
 - Existing infrastructure on and adjacent to the site;
 - Indigenous flora and fauna (biophysical environment); and
 - Water quality of surface and groundwater on and surrounding the site. Particularly the water quality exiting the site.
- To ensure that construction and development are undertaken with consideration to all environmental factors; and
- Where such damage occurs, provision is made for re-instatement and rehabilitation.

1.4 SCOPE

The scope of this EMPr applies to all pre-construction, construction, operation and decommissioning requirements for the Themeda PV. This EMPr applies to all listed and specified activities authorised in the EA and amendments thereto that are necessary for the realisation of this project.

1.5 EMPR APPROVAL AND REVISIONS

This EMPr, once approved, is a legally binding document and contravention with this document constitutes a contravention with the Environmental Authorisation.

The supplementary plans annexed to this EMPr must be read in conjunction with this EMPr.

The EMPr may however require amendment at certain stages through the lifespan of the project. The incidences which may require the amendment of this document include:

- Changes in environmental legislation;
- Results of post-construction monitoring and audit;
- Per instruction from the competent authority; and
- Changes in technology and best practice principles.

It must be noted that any amendments to the EMPr actions that do not change the impact management outcomes or objectives may be immediately affected by the holder of the EA and submitted in the next environmental audit report submitted in terms of the regulations. Any amendments to the impact management outcomes need to be formally approved by the competent authority before they can be effected.

1.6 CONTRACTUAL OBLIGATIONS

This EMPr must be included in ALL tender and contract documentation associated with this project. It must be noted that this EMPr is relevant and binding not only on the activities associated with the construction of the PV project, but also for all associated infrastructure authorised as part of the EA and any amendments thereto.

1.7 ORGANISATIONAL STRUCTURE AND RESPONSIBILITIES.

To ensure effective implementation of the EMPr, it is necessary to identify and define the organisational structure for the implementation of this document.

The proposed organisational structure during **construction** is as follows:

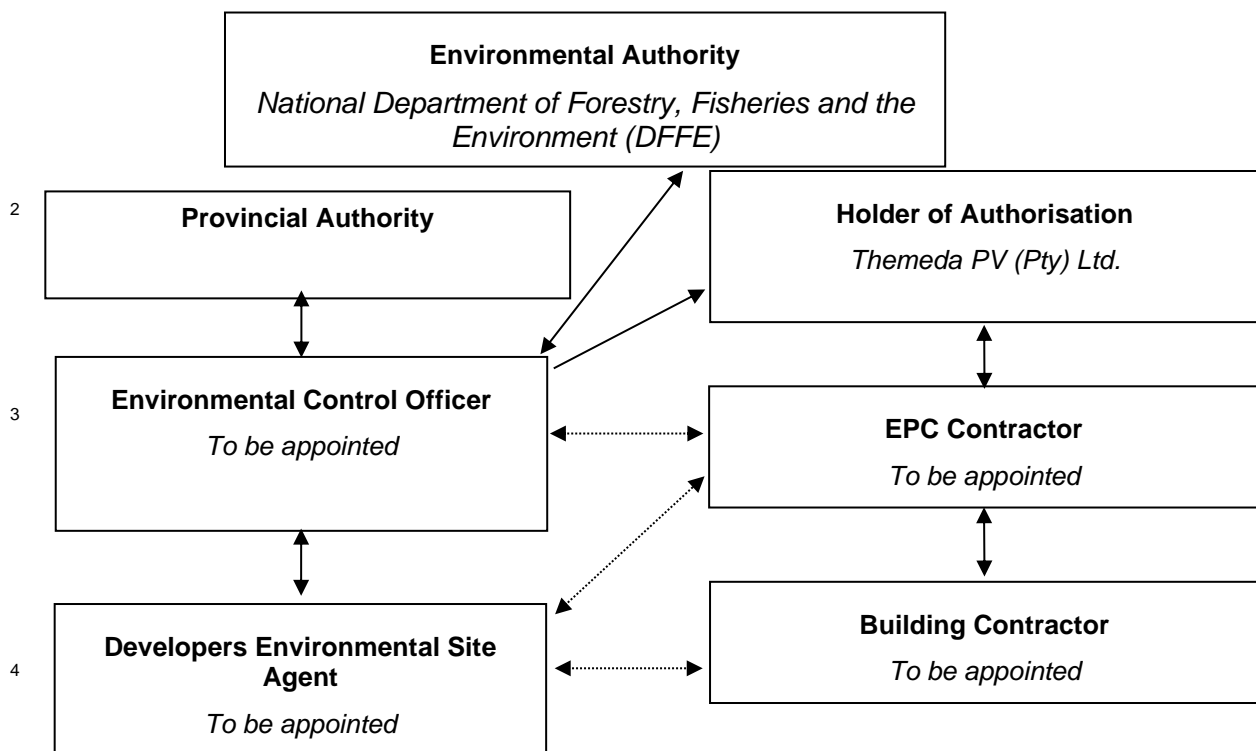


Figure 1: EMPr organisational structure during the construction phase

- ² North West Department of Economic Development, Environment, Conservation and Tourism
- ³ This refers to the Independent Environmental Control Officer.
- ⁴ This refers to the Developers Environmental Site Agent who is not necessarily independent of the EPC.

The proposed organisational structure during the **operation** of the facility is as follows:

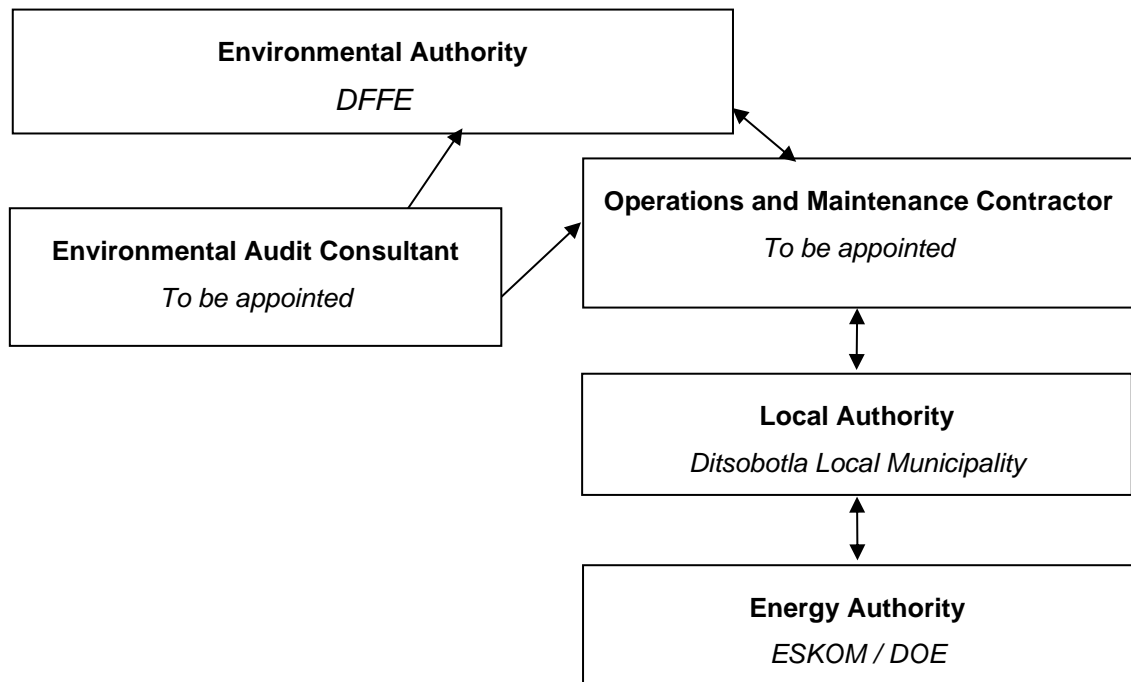


Figure 2: EMPr organisational structure during the operation phase.

Details regarding the roles and responsibilities of the various parties in these organisational structures are included in the table below.

The effective implementation of this EMPr is dependent on established and clear roles, responsibilities and reporting lines. This table below gives guidance to the various environmental roles and reporting lines,

Table 1: Guide to roles and responsibilities for implementation of an EMPr

Responsible Person(s)	Role and Responsibilities
Holder of the EA ⁵	<p><u>Role</u> The holder of the EA is ultimately accountable for ensuring compliance with the EMPr and any conditions of approval from the competent authority. An Independent environmental control officer (ECO) must be contracted by the Holder of the EA to independently and objectively monitor the implementation of the EMPr according to relevant environmental legislation, and the conditions of the EA. The holder of the EA is further responsible for providing and giving mandate to enable the ECO to perform responsibilities and must ensure that the ECO is integrated as part of the project team while remaining independent.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - Be fully conversant with the conditions of the EA; - Ensure that all stipulations within the EMPr are communicated and adhered to by the EPC; - Issuing of site instructions to the EPC for corrective actions required;

• ⁵ In some cases the Holder of the EA and the EPC contractor may be the same entity, in which case this party will be responsible for the requirements outlined on both roles.

Responsible Person(s)	Role and Responsibilities
	<ul style="list-style-type: none"> - Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; and - Ensure that periodic environmental audits are undertaken on the project implementation.
Independent Environmental Control Officer (ECO)	<p>Role</p> <p>The Holder of the EA must appoint an ECO.</p> <p>The ECO must be independent of the holder of the EA and the EPC and have appropriate training and experience in the implementation of environmental management specifications. The primary role of the ECO is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct monthly site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise.</p> <p>The ECO is also required to prepare internal compliance audits (in the form of the monthly environmental control report), verifying the weekly environmental checklists submitted by the ESA.</p> <p>The ECO provides feedback to the Holder of the EA and the competent authority regarding all environmental matters. The EPC and the holder of the EA are answerable to the Environmental Control Officer for non-compliance with the Specifications as set out in the EA and EMPr.</p> <p>The ECO provides feedback to the holder of the EA, who in turn reports back to the EPC, as required. Issues of non-compliance raised by the ECO must be taken up by the holder of the EA and resolved with the Contractor as per the conditions of their contract.</p> <p>Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e., those that are deemed to be a variation, not allowed for in the EMPr specification) must be endorsed by the Holder of the EA.</p> <p>Responsibilities</p> <p>The responsibilities of the ECO will include the following:</p> <ul style="list-style-type: none"> - Be aware of the findings and conclusions of all EA conditions related to the development; - Be familiar with the recommendations and mitigation measures of this EMPr; - Manage and review all reporting undertaken by the ESA. - Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; - Undertake regular (at least monthly) and comprehensive site inspections / audits of the construction site according to the generic EMPr and applicable licenses in order to monitor compliance as required; - Compilation and administration of Environmental control reports to ensure that the environmental management measures are implemented and are effective; - Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements; - In consultation with the holder of the EA order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses; - Liaison between the Holder of the EA, EPC contractor, authorities and other lead stakeholders on all environmental concerns; - Compile a monthly environmental control report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr; - Validating the weekly environmental checklists, which are to be prepared by the ESA; - Checking the ESA's record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken; - Checking the EPC's public complaints register in which all complaints are recorded, as well as action taken; - Assisting in the resolution of conflicts;

Responsible Person(s)	Role and Responsibilities
	<ul style="list-style-type: none"> - In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non-compliance; - Maintenance, update and review of the EMPr; - Communication of all modifications to the EMPr to the relevant stakeholders - Review and approval contractors' method statements.
<p>Developers Environmental Site Agent (ESA)</p>	<p><u>Role</u> The Holder of the EA or the EPC must appoint an independent ESA in terms of this EMPr. The ESA need not be independent of the holder of the EA and the EPC but must report to the ECO and have appropriate training and experience in the implementation of environmental management specifications. The primary role of the ESA is to act as a full-time independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct daily site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ESA is also required to undertake internal compliance audits (in the form of the weekly environmental checklist) and submit these to the ECO and the EPC contractor. The ESA provides feedback to the ECO, who in turn communicates with the holder of the EA and the competent authority regarding all environmental matters. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e., those that are deemed to be a variation, not allowed for in the EMPr specification) must be endorsed by the Holder of the EA.</p> <p><u>Responsibilities</u> The responsibilities of the ESA will include the following:</p> <ul style="list-style-type: none"> - Preparation of Environmental Method Statements; - Daily environmental monitoring; - Be aware of the findings and conclusions of all EA conditions related to the development; - Be familiar with the recommendations and mitigation measures of this EMPr; - Report to the ECO. - Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; - Compilation and administration of weekly environmental checklists to ensure that the environmental management measures are implemented and are effective; - Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements; - Environmental induction of all staff entering the site to perform duties; - Maintaining a record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken; - Assisting in the resolution of conflicts; - Reporting non-compliances to the ECO; - Facilitate environmental training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the EPC contractor;
<p>EPC Contractor</p> <p>NB: All references to the EPC contractor will include all subcontractors responsible for any tasks in respect of the development. All Environmental Management Actions allocated to</p>	<p><u>Role</u> The EPC Contractor or any relevant subcontractor appoints their own dEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. External contractors must ensure compliance with this EMPr while performing the onsite activities as per their contract with the Project Developer. The contractors are required, where specified, to provide Method Statements setting out in detail how the impact management actions contained in the EMPr will be implemented during the development of this facility.</p>

Responsible Person(s)	Role and Responsibilities
the EPC contractor will apply equally to all sub-contractors responsible for any specific task.	<p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - project delivery and quality control for the development services as per appointment; - employ a suitably qualified person to monitor and report to the Project Developer's appointed person on the daily activities on-site during the construction period; - ensure that safe, environmentally acceptable working methods and practices are implemented, and that equipment is properly operated and maintained, to facilitate proper access and enable any operation to be carried out safely; - attend on site meeting(s) prior to the commencement of activities to confirm the procedure and designated activity zones; - ensure that contractors' staff repair, at their own cost, any environmental damage because of a contravention of the specifications contained in EMPr, to the satisfaction of the ECO.

National Government, Provincial Government or Local Authorities must be granted access for the purposed of monitoring compliance with the EA or this EMPr.

1.8 PROPOSED ACTIVITY

The following components form part of the proposed Themeda PV.

- PV modules and mounting structures;
- Inverters and transformers;
- Cabling;
- Battery Energy Storage System (BESS);
- Site and internal access roads (up to 8 m wide);
- Auxiliary buildings (33 kV switch room, gatehouse and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Perimeter fencing and security infrastructure;
- Rainwater tanks;
- Temporary and permanent laydown areas;
- Facility substation.
- Own-build grid connection solution, including on site substation:

It is envisioned that all required services (water, sewerage and waste) will be provided by the local municipality.

The main physical activities (i.e., those activities that need to be managed from an environmental perspective) that will form part of the construction phase are:

- Removal of vegetation for the proposed infrastructure;
- Excavations for infrastructure and associated infrastructure;
- Establishment of a laydown area for equipment;
- Stockpiling of topsoil and cleared vegetation;
- Transportation of material and equipment to site, and personnel to and from site;
- Construction of the solar field, overhead power line⁶, facility substation and additional infrastructure; and
- Rehabilitation of Disturbed areas.

The following main activities will occur during the operational phase:

- Generation of electricity;
- Maintenance of the solar facility, including washing of panels;

• ⁶ The overhead powerline forms part of a separate EMPr.

- Management of the vegetation within the PV development; and
- Maintenance of the distribution line⁷

In the event of decommissioning, the main aim would be to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise (i.e., if the actual SEF becomes outdated or the land needs to be used for other purposes), the decommissioning procedures will be undertaken in line with the EMPr and any legislation or guidelines relevant at the time and the site will be rehabilitated and returned to its pre-construction state. Possible decommissioning activities will include removing the infrastructure, and mechanisms to promote the re-growth of natural vegetation.

2. DOCUMENT CONTROL, REPORTING AND COMPLIANCE

To ensure accountability and effective implementation of the EMPr, a number of reporting systems⁸, documentation controls and compliance mechanisms must be in place for all project infrastructure as a minimum requirement.

2.1 DOCUMENT CONTROL AND FILING

The holder of the EA is solely responsible for the upkeep and management of the official EMPr file. As a minimum, all documentation detailed below will be stored in the EMPr file. A hard copy of all documentation shall be filed, while an electronic copy may be kept where relevant. A duplicate file will be maintained by the ECO. The EMPr file must be always on site and available on request by the Competent Authority or other relevant authorities. The EMPr file will form part of any environmental audits undertaken as prescribed in the EIA Regulations.

2.2 DOCUMENTATION TO BE AVAILABLE

At the commencement of the project the following preliminary list of documents shall be placed in the EMPr file and be accessible at all times:

- Full copy of the signed EA from the Competent Authority in terms of NEMA, granting approval for the development;
- Any Amendments of the EA from the competent Authority;
- Copy of the EMPr as well as any amendments thereof;
- All method statements prepared by the EPC and submitted to the ECO for approval;
- All weekly checklists prepared by the Environmental Site Agent (ESA);
- All monthly ECO reports prepared by the ECO;
- Minutes and attendance register of environmental site meetings;
- Attendance registers of all environmental inductions;
- An up-to-date environmental incident log;
- A copy of all instructions or directives issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record; and
- Complaints register.

All the records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority.

2.3 WEEKLY ENVIRONMENTAL CHECKLIST

-
- ⁷ The distribution powerline forms part of a separate EMPr.
 - ⁸ These reporting systems are adapted from the various generic EMPrs gazetted by the Department of Forestry, Fisheries and the Environment.

The ESA is required to complete a Weekly Environmental Checklist, the format of which should be approved by the ECO, with input from the EPC and the holder of the EA.

The ESA is required to sign and date the checklist, retain a copy in the EMPr file and submit a copy of the completed checklist to the EPC and the ECO on a weekly basis. The EPC must utilise the weekly checklists to initiate any corrective actions detailed therein.

2.4 MONTHLY ENVIRONMENTAL CONTROL REPORT

The ECO is responsible for compilation of the monthly ECO Report. The weekly checklists above will form the basis for the Monthly Environmental Control Reports and must be supplemented by the outcomes of the ECO inspection. The monthly Environmental Control Reports must be submitted to the following parties:

- The Competent Authority – Director Compliance Monitoring;
- The Provincial Conservation Authority;
- The DFFE' sub-directorate, Forestry;
- The Holder of the EA;
- The EPC; and
- All attendees of Environmental Site Meetings.

Copies of all completed Environmental Control reports must be attached as Annexures to the Environmental Audit Report as required in terms of the regulations.

2.5 ENVIRONMENTAL SITE MEETINGS

Minutes of the environmental site meetings shall be kept. The minutes must include an attendance register and will be attached to the Monthly Environmental Control Report that is distributed to attendees. Each set of minutes must clearly record "Matters for Attention" that will be reviewed at the next meeting.

2.6 METHOD STATEMENTS

The method statement will be done in such detail that the ECO is able to assess whether the contractor's proposal is in accordance with the EMPr. Commencement of any specific activity may not commence until such time as the method statement for that activity is approved by both the ECO and the project manager.

The method statement must cover applicable details regarding:

- development 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 EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the ECO, the EPC shall provide the following method statements to the Project Manager no less than 14 calendar days prior to the commencement date of each activity:

- Site establishment – Site Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Workshop or plant emergency maintenance;
- Drilling and Piling operations
- Handling, transport and storage of Hazardous Chemical Substance's;

- Vegetation management – Protected species relocation, site clearing, alien vegetation;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);
- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise management methodologies;
- Fauna interaction and risk management; and
- Heritage, Archaeology and Palaeontology management.

It is the prerogative of the ECO to request additional method statements for any other aspect of the proposed development.

The ESA and ECO shall monitor and ensure that the contractors perform in accordance with these method statements. A copy of all method statements must be kept on the EMPr file and appended to the Monthly ECO report on the month following their approval.

2.7 ENVIRONMENTAL INCIDENT LOG

The ESA is required to maintain an up-to-date and current Environmental Incident Log (environmental diary). The Environmental Incident Log is a means to record all environmental incidents and/or all non-compliance events.

An environmental incident is defined as:

- Any deviation from the listed impact management actions (listed in this EMPr) that is identified by the ESA or ECO (for example, a contractor's staff member littering or a drip tray that has not been emptied);
- Any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions); and
- General environmental information such as road kills or injured wildlife.

The ESA must record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the ECO and the Holder of the EA. The Log is to be kept in the EMPr file (and appended to the monthly environmental control reports) and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor / subcontractor responsible;
- The significance of the incident must be noted;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

2.8 NON-COMPLIANCE

In response to a significant incident, re-occurring incidents or unattended incidents, a non-compliance notice will be issued to the responsible contractor by the ECO via the Holder of the EA or Project

Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.

The contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the development site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define how the environment is managed.

Failure to redress the cause shall be reported by the ECO to the Competent Authority for them to deal with the transgression, as it deems fit, including the issue of penalties as detailed in section 21 of this EMPr. The contractor is deemed not to have complied with the EMPr if, inter alia, there is a deviation from the environmental conditions, impact management outcomes and impact management actions as approved in the EMPr.

2.9 CORRECTIVE ACTION RECORDS

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the ESA or ECO, the EPC must ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the contractors Environmental Officer is to issue a Corrective Action Report in writing to the ECO.

If satisfied that the corrective action has been completed, the ECO are to sign-off on the Corrective Action Report and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report has been signed off by the ECO.

2.10 PHOTOGRAPHIC RECORD

A digital photographic record will be kept by the ESA. The photographic record will be used to show before, during and post rehabilitation evidence of the site as well as in cases of damages claims if they arise. Each image must be dated, include a co-ordinate and a brief description note attached. The ESA photographic record must form part of the weekly Environmental Checklists.

The EPC shall:

- Allow the ESA and ECO access to take photographs of all areas, activities and actions.

The ESA and ECO shall keep an electronic database of photographic records which will include:

- Pictures of all areas designated as work areas, site camp, development sites and storage areas taken before these areas are set up;
- All bunding and fencing;
- Road conditions and road verges;
- Condition of all farm fences;
- Topsoil storage areas;
- All areas to be cordoned off during construction;
- Waste management sites;
- Ablution facilities (inside and out);
- All completed corrective actions for non-compliances;
- All required signage;

- Photographic recordings of incidents;
- All areas before, during and post rehabilitation; and

2.11 COMPLAINTS REGISTER

The EPC shall keep a current and up-to-date complaints register. The complaints register is to be a record of all complaints received from communities, stakeholders and individuals. The Complaints Record shall:

- Record the name and contact details of the complainant;
- Record the time and date of the complaint;
- Contain a detailed description of the complaint;
- Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECO / ESA to take relevant photographs); and
- Contain a copy of the ECO's written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECO shall respond as described in below.

2.12 CLAIMS FOR DAMAGES

If a Claim for Damages is submitted by a community, landowner or individual, the ECO shall:

- Record the full detail of the complaint as described in above;
- The EPC will evaluate the claim and associated damage and submit the evaluation to the holder of the EA for approval;
- Following consideration by the Holder of the EA the claim is to be resolved and settled immediately, or the reason for not accepting the claim communicated in writing to the claimant.

2.13 INTERACTIONS WITH AFFECTED PARTIES

Open, transparent and good relations with affected landowners, communities and regional staff are an essential aspect to the successful management and mitigation of environmental impacts.

The ESA shall:

- Ensure that all queries, complaints and claims are dealt within an agreed timeframe⁹;
- Ensure that any or all agreements are documented, signed by all parties and a record of the agreement kept in the EMPr file and submitted to the ECO;
- Ensure that telephone numbers to register complaints are made available to all landowners and affected parties; and
- Ensure that contact with affected parties is always courteous.

2.14 ENVIRONMENTAL AUDITS

Internal environmental audits of the activity and implementation of the EMPr must be undertaken in the form of the monthly environmental control reports. The findings and outcomes must be included in the EMPr file and submitted to the ECO for inclusion in the environmental control report to be submitted to the competent authority on a monthly basis.

⁹ This relates to complaints and claims of an environmental nature only and does not pertain to complaints and claims of any other nature.

At a minimum, the monthly environmental control report is to cover the following:

- Weekly Environmental Checklists;
- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- Environmental Monitoring;
- Results of Dust Fall out Monitoring;
- General environmental findings and actions; and
- Minutes of the Environmental Site Meetings.

In addition to the internal environmental audit (which takes place as part of the monthly environmental control report), an external audit must be undertaken:

- Within 6 months of commencement of construction activities.
- Within 30 days of completion of construction activities.
- Within 30 days of completion of rehabilitation activities.

These external audits cannot be undertaken by the ECO and must be undertaken by an external audit consultant.

Additional audits during the operational phase of the activity are to be done at the frequency determined in the regulations.

3. LEGISLATIVE AND POLICY FRAMEWORK

In terms of legislative provisions, this EMPr must satisfy:

- Section 24N of the NEMA, as amended;
- Appendix 4 of the NEMA EIA Regulations published in Government Notice No. R 326 of 7 April 2017. These regulations regulate and prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities;
- The requirements outlined in the Environmental Authorisation and
- Gazetted generic EMPs for the power line and substation infrastructure.

Table 2: Compliance with Section 24N of NEMA

Requirements of Section 24N of NEMA	Reference in this EMPr?
2. The environmental management programme must contain-information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of: <ul style="list-style-type: none"> - planning and design; - pre-construction and construction activities; - the operation or undertaking of the activity in question; - the rehabilitation of the environment; and - closure, if applicable; 	Section 5,6 & 14 of this EMPr
Details of the person who prepared the environmental management programme; and the expertise of that person to prepare an environmental management programme;	Please refer to the summary page at the beginning of this report for these details.
A detailed description of the aspects of the activity that are covered by the environmental management programme;	Section 1.8
Information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);	Columns in Section 5,6 and 14 of the EMPr detail the monitoring responsibility.
Information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance;	Section 5, 6, 14 and 16

Requirements of Section 24N of NEMA	Reference in this EMPr?
As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and	Section 8
A description of the way it intends to- <ul style="list-style-type: none"> - modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; - remedy the cause of pollution or degradation and migration of pollutants; and - comply with any prescribed environmental management standards or practices. 	Section 1.2 to 1.4
3. The environmental management programme must, where appropriate- <ul style="list-style-type: none"> - set out time periods within which the measures contemplated in the environmental management programme must be implemented; - contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation which may occur inside and outside the boundaries of the operations in question; and - develop an environmental awareness plan describing the manner in which- <ul style="list-style-type: none"> - the applicant intends to inform his or her employees of any environmental risk which may result from their work; and - risks must be dealt with to avoid pollution or the degradation of the environment. 	Sections 3 – 14 all contain the timeframes for the associated measures.
5. The Minister, the Minister responsible for mineral resources or an MEC may call for additional information and may direct that the environmental management programme in question must be adjusted in such a way as the Minister, the Minister responsible for mineral resources or the MEC may require.	Not applicable at this stage.
6. The Minister, the Minister responsible for mineral resources or an MEC may at any time after he or she has approved an application for an environmental authorisation approve an amended environmental management programme.	Not applicable at this stage.
7. The holder and any person issued with an environmental authorisation- <ul style="list-style-type: none"> - must at all times give effect to the general objectives of integrated environmental management laid down in section 23; - must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment; - must manage all environmental impacts in accordance with his or her approved environmental management programme, where appropriate; and - as an integral part of the prospecting or mining, exploration or production operation, unless the Minister responsible for mineral resources directs otherwise; - must monitor and audit compliance with the requirements of the environmental management programme; - must, as far as is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and - is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations to which such right, permit or environmental authorisation relates. 	Throughout the EMPr
8. Notwithstanding the Companies Act, 2008 (Act No. 71 of 2008), or the Close Corporations Act, 1984 (Act No. 69 of 1984), the directors of a company or members of a close corporation are jointly and severally liable for any negative impact on the environment, whether advertently or inadvertently caused by the company or close corporation which they represent, including damage, degradation or pollution.	Section 1.7 details the responsibility of the Project Applicant.

Table 3: Compliance with Appendix 4 of the 2014 NEMA EIA Regulations (as amended on 7 April 2017)

Requirement	Description
Details of the EAP who prepared the EMP; and; The expertise of the EAP to prepare an EMP, including a curriculum vitae.	This EMP was prepared by Dale Holder of Cape EAPrac who has more than 16 years' experience as an Environmental Assessment Practitioner. The CV of the EAP is attached in appendix I.
A detailed description of the aspects of the activity that are covered by the EMP as identified by the project description.	This EMP covers all aspects of the project as currently Proposed for Themeda PV <ul style="list-style-type: none"> • PV modules and mounting structures; • Inverters and transformers; • Cabling; • Battery Energy Storage System (BESS); • Site and internal access roads (up to 8 m wide); • Auxiliary buildings (33 kV switch room, gatehouse and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.); • Perimeter fencing and security infrastructure; • Rainwater tanks; • Temporary and permanent laydown areas; Facility substation. <ul style="list-style-type: none"> • Own-build grid connection solution, including on site substation:
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	The Site Development Plan attached in Appendix A, includes the sensitive features identified by participating specialists and indicates how these have been incorporated. The "exclusion areas" identified on this SDP as well as all areas outside of the perimeter fencing of the facility are considered as no go areas for construction activities.
A description of the impact management objectives, 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 the phases of the development including – <ul style="list-style-type: none"> (vi) Planning and design; (vii) Pre-construction activities; (viii) Construction activities; (ix) Rehabilitation of the environment after construction and where applicable post closure; and (x) Where relevant, operation activities. 	Sections 1.3
A description and identification of impact management outcomes required for the aspects contemplated above.	Sections 4 -11
A description of the proposed impact management actions, identifying the way the impact management objectives and outcomes contemplated above will be achieved and must, where applicable include actions to – <ul style="list-style-type: none"> (v) Avoid, modify, remedy control or stop any action, activity or process which causes pollution or environmental degradation; 	Sections 4 - 11

Requirement	Description
(vi) Comply with any prescribed environmental management standards or practises; (vii) Comply with any applicable provisions of the Act regarding closure, where applicable; and (viii) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.	
The method of monitoring the implantation of the impact management actions contemplated above.	Sections 4 – 11 and section 14
The frequency of monitoring the implementation of the impact management actions contemplated above.	Sections 4 – 11 and section 14
An indication of the persons who will be responsible for the implementation of the impact management actions.	Sections 4 – 11
The time periods within which the impact management actions must be implemented.	Sections 4 – 11 and section 14
The mechanism for monitoring compliance with the impact management actions.	Section 2 and 4-11
A program for reporting on compliance, considering the requirements as prescribed in the Regulations.	Section 2
An environmental awareness plan describing the way – (iii) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and (iv) Risks must be dealt with to avoid pollution or the degradation of the environment.	Section 5.2
Any specific information that may be required by the competent authority.	None.

Other than the Section 24N and Appendix 4 requirements detailed in the table above, the applicable legislation remains the same as what was considered in the Basic Assessment Report for the Themeda PV and as such, it is not re-described in this EMPr.

4. PRE-CONSTRUCTION PHASE– IMPACT MANAGEMENT OUTCOMES & ACTIONS

This section provides details on the pre-construction phase impact management outcomes and actions¹⁰ that are commonly applicable to the development of a PV Energy Facility and its associated infrastructure as well as management actions outlined by participating specialists, preceding environmental process and those contained in the EA for the facility.

Each subsection includes an aspect identified for the development of the PV Energy Facility, and for each aspect a set of prescribed impact management outcomes and associated impact management actions have been identified.

The holder of the EA is ultimately responsible to ensure the implementation of these outcomes and actions.

4.1 PRE-CONSTRUCTION EA CONDITIONS.

The Environmental Authorisation for this development will require a number of administrative requirements that need to take place prior to commencement of construction. These must be included in the EMPr once the EA in respect of this activity is received.

4.2 APPOINTMENT OF ENVIRONMENTAL CONTROL OFFICER AND ENVIRONMENTAL SITE AGENT

The holder of the EA must appoint an independent Environmental Control Officer (ECO) for the construction phase of the Development.

Impact management outcome: Independent party to ensure that the mitigation/rehabilitation. measures and recommendations referred to in the EA are implemented and reported on and to ensure compliance with the provisions of the approved EMPr.						
Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> The ECO must be appointed prior to the commencement of any physical activities. The ECO will be responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of this EMPr and the conditions of the EA. 	Holder of the EA	The holder of the EA to appoint independent ECO and ensure that ECO is suitably qualified and experienced.	ECO to be appointed prior to construction	ECO will undertake physical monitoring.	Monthly	The name and contact details of the appointed ECO to be submitted to the Director: Compliance

¹⁰ All Environmental Management Actions allocated to the EPC contractor will apply equally to all sub-contractors responsible for any specific task.

<ul style="list-style-type: none"> • The appointed ECO must be independent of the EPC contractor and must be suitably qualified and have experience of environmental monitoring and control on similar scale projects. • The main responsibilities of the ECO include but are not limited to the following: <ul style="list-style-type: none"> - Facilitate the pre-construction environmental compliance workshop; - Review of documentation supplied by the ESA; - Be fully knowledgeable of all the licences and permits issued to the site - Review, maintenance and update of the EMPr; - Liaison between the Project Proponent, Contractors, Authorities and other lead stakeholders on all environmental concerns, including the implementation of the EMPr; - Compilation of monthly Environmental Control Report/s (ECR) to ensure compliance with the EMPr and authorisations. Reports should be submitted to the relevant authority on a monthly basis; - Monitor compliance with this EMPr; - Monitor compliance with the EA; - Monitor implementation of the mitigation and rehabilitation measures and recommendations referred to in the EA, preceding environmental assessment, participating specialists and this EMPr. - Recommend the issuing site instructions to the EPC contractor for corrective actions required; - ECO site inspections should be undertaken at least once a month to ensure compliance with the EMPr. The duration of these visits may be increased or decreased at the discretion of the ECO in consultation with the holder of the EA. The Environmental Site Agent as described below should be on site daily and be in communication with the ECO on a daily basis; - Attendance of regular contractors' site meetings; - Maintain a record of environmental incidents (e.g., spills, impacts, legal transgressions etc.) as well as corrective and preventative measures taken. - Maintain public complaints register in which all complaints and action taken / responses must be recorded. - Keep Record of all activities on site, problems identified, transgressions noted, and a task schedule of tasks undertaken by the ECO; and • The holder of the EA, on advice from the ECO, has the authority to stop work on site if he / she consider that any actions of excessive non-compliance of the EMPr, authorisations or General Duty of Care are taking place. • The ECO must remain employed until all rehabilitation measures are completed. 					<p>Monitoring at DFFE.</p> <p>ECO to submit monthly Environmental Control Report to the Director: Compliance Monitoring at DFFE.</p>
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In addition to the ECO, this EMPr requires the appointment of a Environmental Site Agent (ESA) for the duration of the construction period of the project (this ESA must be appointed in the pre-construction phase, prior to the commencement of construction activities). The ESA need not be independent and can be appointed by the EPC.

Impact management outcome: To ensure independent full time environmental expertise on site to monitor and report on compliance

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The ESA must be appointed prior to the commencement of any physical activities. • The ESA will be responsible for daily monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of this EMPr and the conditions of the EA. • The appointed ESA must be suitably qualified and have experience of environmental monitoring and control. • The main responsibilities of the ESA include but are not limited to the following: <ul style="list-style-type: none"> - To ensure compliance with the EMPr and EA; - The ESA is required to be on site daily, which may be reviewed by the ECO and holder of the EA as construction requirements dictate; - Undertaking environmental induction of all staff; - Attending all on site construction meetings (including, but not limited to, technical and progress meetings); - Providing the ECO with a weekly environmental checklist; - Developing and maintaining a detailed photographic site record throughout the construction phase of the project; - Maintaining file records of all method statements provided by the contractors; - Management and ensuring timeous and effective rehabilitation of the site; - Maintain a record of environmental incidents (e.g., spills, impacts, legal transgressions etc.) as well as corrective and preventative measures taken. This information must also be included in the weekly reports; - Maintain public complaints register in which all complaints and action taken / responses must be recorded. 	EPC Contractor	The EPC contractor to appoint independent ESA and ensure that ESA is suitably qualified and experienced.	ESA to be appointed prior to construction	ESA will undertake physical monitoring.	The ESA to monitor site daily and provide a formal report back weekly.	<p>The name and contact details of the appointed ESA to be submitted to the Director: Compliance Monitoring at DFFE.</p> <p>Weekly Environmental Checklists to be provided to the EPC and the ECO.</p>

Impact Management Actions	Responsible person	Method implementation of	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> - If the ESA observes non-compliance that requires a “stop work” order, the ECO must immediately be informed and will request the holder of the EA to issue such an order if necessary. • The ESA must remain employed until all rehabilitation measures are completed. 						

The ECO must have a minimum of a tertiary level qualification in the natural sciences field, as well as at least 8 years’ experience and proven competency as an ECO, with extensive experience on similar scale Developments.

The ESA must have a minimum of a tertiary level qualification, as well as at least 1 years’ experience on similar scale developments and proven competency as an ECO.

4.3 PRE-CONSTRUCTION ENVIRONMENTAL COMPLIANCE WORKSHOP

It is a required action that a pre-construction environmental compliance workshop be undertaken before any construction commences on site.

Impact management outcome: To ensure that all senior contract staff members have an in-depth knowledge of the environmental requirements for the site in terms of the EA and EMPr.

Impact Management Actions	Responsible person	Method implementation of	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • It is a required action that a pre-construction environmental compliance workshop be undertaken before any construction commences on site. This workshop can be combined with a site handover meeting but must take place before any activities take place on site and before any plant is moved onto site. 	Holder of the EA	The holder of the EA must arrange the invites to the workshop. ECO to present the workshop	Prior to commencement of construction.	ECO	Once off.	ECO to issue minutes of the workshop, to be included in first monthly environmental control report.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The purpose of this workshop is to ensure that all relevant senior personnel are familiar with the provisions of the EMP, as well as the conditions of the EA. • The following people must be present at this Environmental Compliance Workshop: <ul style="list-style-type: none"> - The holder of the EA; - The ECO; - The EPC Contractor (including contract manager, site agent and foreman); - The sub-EPC contractor if appointed - The Electrical Contractor (including contract manager, site agent and foreman); - The Consulting Engineers (electrical, civil and structural, whichever applicable); and - Project and Asset Management. • Provision should be made in contract and tender documentation to attend a 6-hour workshop that will be chaired by the ECO. • Due to covid regulations and concerns, this workshop may take place on a virtual platform or on site. 						

4.4 PRE-CONSTRUCTION ECOLOGICAL REQUIREMENTS

It is required that, a pre-construction survey of the final development footprint must be conducted to ascertain the identity and exact numbers of individuals of protected species affected by the proposed development. A copy of this ecological walkthrough report is attached in Appendix L. No clearing of vegetation may take place until such time as all required permits in terms of both the provincial and national legislation are in place.

A single integrated permit, which covers nationally or provincially listed plant species permitting requirements, as well as meets TOPS regulations, must be obtained from the Cape Nature prior to the any plant rescue / transplant and/or removal activities. A licence for the removal of species protected in terms of the National Forest Act may also be required.

The ESA should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing.

4.5 WATER CONSERVATION.

It is important that the proposed water conservation infrastructure for both the construction as well as operational phases is considered at the pre-construction phase prior to any procurement taking place.

Impact management outcome: To ensure design criteria promotes sustainable resource use.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<p>All buildings should be fitted with rainwater collection and storage systems to supply water to the taps and toilets in these buildings, as well as any outdoor requirements (landscaping, washing etc).</p> <p>All toilets (excluding temporary toilets) should be fitted with dual flush systems¹¹.</p> <p>All taps to be installed in the control / substation / workshop buildings must be fitted with low-flow faucets.¹².</p> <p>The design of any temporary water reservoirs for construction water should have the smallest practically possible surface area to reduce evaporation. Under no circumstances will the discharge of treated water, wastewater or effluent be allowed.</p>	Holder of the EA	The design engineers must consider all relevant resource conservation measures in the design phase of the development	Prior to commencement of construction.	ECO / ESA	During and on completion of all associated building infrastructure on site.	Monthly ECO Report.

4.6 AVIFAUNAL MANAGEMENT

To reduce impact on the Avifaunal Component of the site, the following management actions take place during the pre-construction phase of the development.

- ¹¹ Conservative estimates have shown that a saving of more than 22 000 litres per household (this could apply to the workshops that are occupied by day and night staff) can be achieved annually with the installation of dual flush toilets (Aquanotion, 2008).
- ¹² Low flow faucets use aerators to reduce the flow of the water. These can either be built into the faucet or added as an aftermarket product. The faucets in bathrooms should have a peak flow of less than 10 litres per minute.

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
Avifauna: Entrapment					
Entrapment of medium and large terrestrial birds between the perimeter fences, leading to mortality.	Prevent mortality of avifauna	A single perimeter fence should be used ¹³ . No electrified wires should be within 300m of the ground. Protect remaining habitat within the farm portion.	Design the facility with a single perimeter fence or with two fences at least 4 metres apart.	Once-off during the planning phase.	Project Developer

5. CONSTRUCTION PHASE – IMPACT MANAGEMENT OUTCOMES AND ACTIONS

This section provides details on the construction phase impact management outcomes and actions¹⁴ that are commonly applicable to the development of a PV Energy Facility and its associated infrastructure as well as management actions outlined by participating specialists, EAP and those contained in the EA for the facility.

Each subsection includes an aspect identified for the development of a PV Energy Facility, and for each aspect a set of prescribed impact management outcomes and associated impact management actions have been identified.

The holder of the EA is ultimately responsible to ensure the implementation of these outcomes and actions.

The signed method statements prepared by the EPC contractor to achieve these environmental management outcomes must be appended to this EMPr as Appendix N¹⁵ and kept on record in the EMPr file.

5.1 CONSTRUCTION PHASING

- ¹³ A fence consisting of an outer diamond mesh fence and inner electric fence with a separation distance of approximately 100mm would not pose any risk of entrapment for large terrestrial species and can be considered a single fence.
- ¹⁴ All Environmental Management Actions allocated to the EPC contractor will apply equally to all sub-contractors responsible for any specific task.
- ¹⁵ Method statements only to be appended once they are approved by the ECO.

There are a number of important aspects of the construction phasing that must be implemented to ensure that the potential impact on the environment is kept to a minimum. The EPC contractor must implement the following requirements regarding phasing, when developing the construction programme. This construction programme must be approved by the holder of the EA with input from the ECO.

- The main access road, perimeter fence and internal road network to access the panel arrays should be established first and then all vehicular movement must be restricted to within this road network - This will minimise the impact of construction traffic on the undeveloped portion of the property. The only vehicles allowed to move off this road network are those needed to install the PV Mounting structures (i.e., Drills and Piling machines).
- Sites that will be temporarily disturbed by the construction activities (i.e., Temporary access, material loading, temporary storage, turning circles, etc.) must also be included in the road access network.

5.2 ENVIRONMENTAL AWARENESS AND TRAINING

It is a required action that the ESA, in consultation with the EPC, 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 EMP, EA and the environmental requirements they prescribe.

The ESA must keep records of all environmental training sessions, including names, dates and the information presented. Details of the environmental induction are also to be included in the weekly environmental checklists and monthly environmental control reports.

Impact management outcome: All onsite staff are aware and understand the individual responsibilities in terms of this EMP.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • All staff must receive environmental induction training prior to undertaking any activities on site; • The EPC contractor must provide 24h notice to the ESA to arrange a suitable time for the ESA to present the induction training; • Refresher environmental awareness training is available as and when required; • All staff are aware of the conditions and controls linked to the EA and within the EMP and made aware of their individual roles and responsibilities in achieving compliance with the EA and EMP; 	EPC Contractor and ESA	<p>ESA to present a pre-prepared environmental induction to all staff prior to them undertaking any activities on site.</p> <p>EPC to ensure that all environmental awareness posters</p>	Throughout construction period	ESA	Weekly as part of the weekly environmental checklist.	Signed environmental induction attendance registers to be appended to weekly environmental checklist and monthly

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The EPC contractor must erect and maintain information posters at key locations on site, and the posters must include the following information as a minimum: <ul style="list-style-type: none"> - Safety notifications; - Faunal Occurrences and risks; - Photographic plates of all listed and protected flora; - Hydrocarbon Spill management and correction and - Waste Management. • Environmental awareness training must include as a minimum the following: <ul style="list-style-type: none"> - Description of significant environmental impacts, actual or potential, related to their work activities; - Mitigation measures to be implemented when carrying out specific activities; - Environmental emergency preparedness and response procedures; - No Go Areas - Procedures to be followed when working near or within sensitive areas; - Wastewater management procedures; - Water usage and conservation; - Solid waste management procedures; - Sanitation procedures; - Fire prevention; - Faunal conflicts and - Vegetation management and protected & listed flora. • The EPC contractor must provide translation services to Ensure that the environmental induction be translated into the relevant languages. 		<p>are in place at a minimum of 2 locations on site and that these posters are maintained.</p> <p>ESA to attend toolbox talks at least once a week, where an environmental topic is presented (this topic should be linked to current environmental concerns on the site at that stage)</p>				environmental control report.

5.3 DEMARCATION OF NO-GO AREAS

It is required that all areas outside of the physical development footprint are to be demarcated as no-go areas and access to these areas restricted. All construction activities must be restricted to demarcated areas to restrict the impact on sensitive environmental features. The impact management actions detailed below will help in achieving this end.

Impact management outcome: To ensure the protection of all the natural areas, sensitive features and buffer areas outside of the physical development footprint

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> The exact footprint of the construction area, including panel foundations and all roads (including access, haul and internal roads which must make use of the final road layout) and infrastructure are to be surveyed and pegged before any physical construction commences on site. To ensure effective demarcation of no-go areas, the construction of the perimeter fence should be the first activity that takes place on site. All sensitive features as identified by specialists or ECO within the footprint must be demarcated for exclusion. Appropriate signage is to be placed at all No-Go Areas The contractor, in conjunction with the ECO and ESA, must walk the areas determined and mark the full extent of the area to be disturbed (allowing sufficient space for the construction activity); All areas beyond these demarcated areas are considered as “no-go” areas; Construction staff must be briefed as part of the environmental induction on the requirements regarding the no-go areas; and Any protected trees or plants that are to remain within the development footprint are to be physically demarcated. 	EPC Contractor	<p>The EPC contractor to ensure that all no-go demarcations are in place and maintained for the duration of the contract.</p> <p>The ESA to ensure that compliance with the no-go policy forms part of the environmental induction.</p> <p>ESA to monitor compliance with no-go areas.</p>	<p>Survey and pegging to commencement of construction.</p> <p>Formal perimeter fence to be constructed in parallel to site establishment</p>	ESA / ECO	<p>ESA to monitor Daily.</p> <p>ECO to monitor Monthly.</p>	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.4 ESTABLISHMENT OF CONTRACTORS SITE CAMP AND TEMPORARY LAYDOWN AREA.

No temporary site camps are allowed outside of the development footprint.

The position of the contractors site camp and temporary laydown area must as be shown in the approved site layout plan. It must be noted that the contractors site camp and laydown area are temporary areas for use during the duration of construction. These areas must be rehabilitated on completion of construction as detailed in section 5.20 below. A permanent laydown area not exceeding 1 Hectare may remain for the duration of the operational phase of the project.

Impact management outcome: To ensure that the high impact activities that typically take place in a contractor's site camp / laydown area are restricted to a predefined area that does not contain any sensitive features and is rehabilitated on completion of construction.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The Contractors Site Camp and Temporary Laydown must be situated within the development area in the position identified in the approved Site Layout Plan • No temporary site camps will be allowed outside of the development footprint; • Any necessary plant rescue within the site camp and temporary laydown must be undertaken prior to the stripping of topsoil. • Topsoil from the site camp and temporary area must be stripped and stockpiled for re-use during rehabilitation. This must be done prior to levelling and placement of gravel; • The site camp must be suitably fenced off; • All construction material must be stored in the site camp, unless otherwise approved by the ECO. This may exclude PV panel mounting structures and panel components which will be stored at each installation point, as per the manufacturer plans; • No personnel may overnight in the site camp, except in the case of security personnel; • Fires for cooking and/or heating are only allowed within the site camp after consultation with the Health and Safety Representative; • Fuel and other chemicals may only be stored in the camp site; • Storage of waste and waste management must take place within the site camp and must be removed on a regular basis. • Temporary waste pick up points in the field must be moved to the site camp on a daily basis; • The site camp must be provided with sufficient ablution facilities (chemical toilets and potable water) of which the content must be disposed of regularly and at the suitable facilities.; 	EPC Contractor	<p>The EPC contractor to provide method statement for site camp and temporary laydown establishment.</p> <p>The ESA and ECO to monitor compliance with site camp and laydown requirements.</p> <p>ECO to sign off on final rehabilitation of the site camp and temporary laydown area.</p>	<p>Site camp to be established prior to delivery of materials and plant (with the exception of plant and material required for the establishment of the perimeter fence)</p>	ESA / ECO	<p>ESA to monitor Daily.</p> <p>ECO to monitor Monthly.</p>	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Any security lighting must be restricted to the Site Camp and Laydown area and no security lighting may be placed in the field; Lighting during both the construction as well as operational phase of the development must be a low-pressure sodium or Led type, preferably yellow or warm white; All security lighting should be attached to motion sensors and be dark sky friendly¹⁶; and On completion of construction, the site camp and temporary laydown area must be rehabilitated as directed. 						

5.5 MANAGEMENT OF TOPSOIL

Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation.

In terms of best practice and for rehabilitation purposes, it is essential that at least 300mm layer of topsoil from the building and road footprints (i.e., the on-site substation, auxiliary buildings, contractor’s site camp and temporary laydown area) be stripped and stockpiled prior to the commencement of construction activities in each area. Topsoil should not be stripped from the development footprint below the solar arrays except where trenching for cabling is required (in which case topsoil should be placed on the opposite side of the trench from the subsoils and placed back in the same trench when cables are covered up).

Impact management outcome: To ensure that the handling of topsoil does not result in the pollution or loss of the resource.

¹⁶ In order to achieve this, all lighting should only be on when needed, only light the area that needs it, be no brighter than necessary, minimize blue light emissions and be fully shielded (pointing downward).

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The EPC must ensure sufficient topsoil is reclaimed to provide for rehabilitation of temporary disturbed areas as well as for long term storage for rehabilitation post operations. • A minimum 300mm layer of topsoil must be stripped from the access, internal and perimeter roads, on-site substation, auxiliary buildings, contractors site camp and temporary laydown area; • The topsoil stockpile sites must be approved by the ECO and may not be within any sensitive areas as defined by the ECO; • Topsoil stockpiles may not obstruct natural water pathways and drainage channels. • The topsoil may not be stockpiled within any of the remaining natural areas (i.e., any open spaces between modules). An existing disturbed area within or adjacent to the laydown areas should rather be chosen for this purpose; • The topsoil stockpiles must be protected from erosion and dust as indicated by the ECO and this EMPr; • The topsoil stockpiles must be clearly demarcated to avoid contamination; • No topsoil may be mixed with subsoil; • No topsoil may be used as bedding material for cable trenches; • Topsoil stockpiles must not exceed 2m in height and stockpiles older than 6 months must be enriched before they are re-used. • The topsoil must be replaced into disturbed areas (road verges, cable trenches and contractors site camp) on completion of construction; 	EPC Contractor	<p>The EPC contractor to provide method statement for topsoil management.</p> <p>The ESA and ECO to advise on the placement of topsoil stockpiles.</p> <p>The ESA and ECO to monitor compliance.</p> <p>ECO to sign off on final rehabilitation of the site camp and temporary laydown area.</p>	Prior to construction activities in each specific area.	ESA / ECO	<p>ESA to monitor Daily.</p> <p>ECO to monitor Monthly.</p>	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.6 WATER SUPPLY

This section is specific to water supply during the construction phase. Water supply for the washing of panels is discussed under the operational phase requirements.

Impact management outcome: To ensure water used during construction is lawfully and sustainably utilised.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The EPC contractor must ensure that all water sources utilised are lawful. • The EPC Contractor must ensure a supply of water is available on site for sanitation, drinking, dust suppression and all construction activities. • The EPC Contractor must ensure that water supplied for drinking water is of potable standards. • Water used for dust suppression on gravel roads must be of a quality compliant with the General Special Effluent Standards (31/03/2009): Temperature: max.25°C, pH: between 5.5 & 7.5 and conductivity: not be increased more than 15% above the intake water & not exceed 250 milli-Siemens per metre (determined at 25°C). • No chemically treated or wastewater may be used for dust suppression. • Should any temporary water storage reservoirs need to be constructed for the purposes of construction, these must be positioned within the footprint of the development in a position agreed to with the ECO. Sufficient mechanisms to prevent fauna entrapment must be implemented to the satisfaction of the ECO. • Carry out Environmental Awareness Training with a discussion on water usage and conservation – This should form part of the Environmental Induction of all construction staff. • The EPC contractor must maintain records of all water usage (via metering and / or water tuck logs) for the duration of the construction phase. 	EPC Contractor	<p>The EPC contractor to provide method statement for Water Supply.</p> <p>The EPC Contractor must supply records of tests undertaken on drinking water to show that it is within potable standards (these tests should be done on a three-monthly basis or anytime the water source changes)</p> <p>The EPC to measure (internally) PH, TDS and Conductivity of all water sources on a weekly basis.</p>	<p>Lawfulness and quality testing need to take place prior to construction.</p> <p>Remaining actions applicable for the duration of the construction phase.</p>	<p>EPC Contractor to provide initial and 3 monthly quality test results to ESA.</p> <p>EPC Contractor to supply weekly tests to ESA.</p> <p>Water usage records to be provided by EPC contractor on a weekly basis.</p> <p>ESA / ECO to review results and provide recommendations.</p>	<p>3 Monthly for Potability tests.</p> <p>Weekly for internal testing</p>	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.7 VEGETATION CLEARING

The objective of mitigation for any development is to firstly avoid and minimise impacts on vegetation where possible and where these cannot be completely avoided, to compensate for the negative impacts of the development on vegetation and faunal habitats, and to maximise re-vegetation and rehabilitation of disturbed areas. This section deals with the management of impacts associated with the clearing of vegetation. Please refer to the section below for details regarding the rehabilitation and restoration of affected areas after completion of the construction activities.

Some loss of vegetation is an inevitable consequence of the construction of PV facilities, and vegetation clearing required for the laydown area, roads, buildings etc. could impact listed plant species, as well as high-biodiversity plant communities. Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.

The environmental impact management actions detailed in this section as well as those in the previous section on demarcation of no-go areas will help achieve this end.

It must be noted that no vegetation clearing may occur until such time as permits for the removal of provincially protected species as well as species protected in terms of the National Forest Act are in place.

Impact management outcome: To ensure that vegetation is lawful, minimised and restricted to the development footprint.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Vegetation clearing can only commence once: <ul style="list-style-type: none"> - All necessary permits are in place, - Plant Rescue has been undertaken, - Development footprint has been Demarcated • Vegetation clearing must be kept to a minimum and restricted to the following areas: <ul style="list-style-type: none"> - Internal Road Network, - Perimeter Road, - Inverter / Transformer Stations, - Laydown Area, - Site Camp and - Building Footprints 	EPC Contractor	The EPC contractor to provide method statement for vegetation clearing activities.	Throughout the duration of construction.	ESA / ECO	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • For the PV Array, the underlying grass/ sedge layer should be left intact (albeit trampled by construction activities) and only the larger woody plants cleared or trimmed. • All areas to be cleared should be clearly demarcated, prior to the commencement of clearing activities; • Vegetation cleared / removed as part of the site clearing activities must be stockpiled for use during the re-vegetation and rehabilitation stage for brush-packing. The location of the vegetation stockpile can be in the same area as the topsoil stockpile, as designated in consultation with the ECO; • Only those individuals of protected plant species directly within the development footprint should be cleared. Those which can be safely left intact (e.g., below or between the solar panel arrays) must not be disturbed; • Any vegetation clearing that needs to take place as part of maintenance activities (during construction and operation phases) should be done in an environmentally friendly manner, using the most effective methodology suited to the target species (herbicides and/or manual clearing). 						

5.8 TRENCHING AND CABLING

Electric cables required to connect the inverters to the on-site switching station (i.e., AC cables) within the boundaries of the development must be installed underground, within or parallel to the internal road network and/or paths between the panel rows, as far as possible. Preference should be given to mounting the DC cabling to the panel arrays, although it is understood that there will also be limited trenching associated with the DC cabling.

Cable trench excavation, cable laying and backfill must be carried out in a systematic and continuous operation, minimising the length of trench open at any one time in order to reduce the risk of runoff or faunal entrapment. Cable trenches must be backfilled in such a manner as to prevent the trench from acting as a ditch or a conduit for water flow.

Impact management outcome: To ensure that trenching activities are spatially restricted and do not result in loss or contamination of topsoil resources.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Trenching shall be kept to a minimum through the use of single trenches for multiple service provision (including communication cabling and AC cabling in the same trenches); • Open trenches to be closed as quickly as possible to prevent faunal entrapment and erosion; • The planning and selection should be done in approximation to the SDP and cognisance shall be given to minimising the potential for soil erosion; • Trench routes with permitted working areas shall be clearly defined and marked with prior to excavation; • The stripping and separation of topsoil and subsoil shall occur on separate sides of the excavated trench and replaced in the same order (i.e., topsoil on top); • Trench lengths shall be kept as short as practically possible before backfilling and compacting; • The ECO may require the planting of additional indigenous vegetation along trench routes in order to speed up rehabilitation (particularly in areas that may be prone to erosion); • Open trenches must be inspected daily for faunal entrapment (small mammals and reptiles), which are to be removed before backfilling of the trenches; • Trenches shall be backfilled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion. Excess soil shall be stockpiled in an area designated by the ECO. • Topsoil may not be used for bedding or blanket material in trenches. 	EPC Contractor	The EPC contractor to provide method statement trenching activities.	Throughout the construction phase	ESA and ECO	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.9 DRILLING AND RAMMING OPERATIONS

It is envisioned that drilling and ramming will be the preferred method of installing the panel support structures / sub-structures. The following actions must be implemented in this regard.

Impact management outcome: To ensure that installation of the sub-structures do not cause pollution or undue mechanical damage to the environment.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> The plant required for the installation of the sub-structures (i.e., the trackers and module mounting structures) is the only plant that is allowed to leave the internal road network. <p>The contractor shall submit a method statement detailing his proposals to prevent pollution (from hydraulic fluids, fuel or oil leaks) during ramming operations. This shall be approved by the Employers Representative and the ECO prior to the onset of any ramming operations;</p> <ul style="list-style-type: none"> The contractor shall take all reasonable measures to limit dust generation as a result of drilling and ramming operations (also see section below addressing management of dust); Noise and dust nuisances shall comply with the applicable standards according to the Occupational Health and Safety (Act No. 85 of 1993) as well as the dust control regulations; Other than the known acceptable impact from trampling, any areas damaged by the ramming and associated activities shall be rehabilitated by the contractor to the satisfaction of the ECO. 	EPC Contractor	The EPC contractor to provide method statement drilling and ramming operations.	Throughout the construction phase	ESA and ECO	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.10 FENCING

During construction it will be necessary to fence in the Contractor's Site Camp (to avoid theft of construction equipment and materials) and the PV Laydown Area/s (to avoid theft of the solar panels and associated infrastructure). This temporary fencing will be restricted to these areas and be removed at the end of the construction phase. The total footprint of the facility will be fenced with a permanent perimeter electrified fence to protect the operational assets.

Electric fencing should not have any strands within 30cm of the ground (to allow for the movement of small mammals and reptiles).

Impact management outcome: To ensure that fencing protects project assets and the environment while limiting impact on faunal passages.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> The establishment of the perimeter fence should be the first activity that takes place on site, as this serves to demarcate the total disturbance footprint. Any sensitive features within the project footprint should be temporarily fenced prior to commencement of construction (refer to above section on the demarcation of no-go areas). This temporary fencing must be replaced with permanent fencing prior to the completion of the construction phase. Temporary storage ponds and topsoil stockpile should be temporarily fenced. The perimeter security fencing should be constructed in a manner which allows for the passage of small and medium sized mammals, at strategic places, such as areas of dense vegetation In accordance with the EA, electrified strands should not be within 30cm of the ground. Only the facility itself should be fenced-off. Other than the fencing around the site camp / laydown area and operational buildings. No lighting may be placed on the perimeter security fencing. The final fencing plan should be submitted to the ECO for comments and approval. 	EPC Contractor	<p>Implementation of the actions herein.</p> <p>EPC contractor to submit final fencing plan to the ECO for approval.</p>	Throughout the construction phase	ESA and ECO	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.11 CONSTRUCTION VEHICLES AND TRAFFIC MANAGEMENT PLAN

Construction vehicles carrying materials to the site, should avoid using roads through densely populated areas as to not disturb existing retail and commercial operations. It is important that a permit for all abnormal loads be obtained from provincial government.

During the EIA for this project, JG Afrika prepared a traffic impact assessment (Attached to this EMPr). This document with the general management of traffic access in terms of the access to the site and management of abnormal loads etc. The EPC contractor must comply with the management requirements detailed in these documents as well as those below:

Impact management outcome: To minimise the impact on the road network from dust and noise pollution as well as the transport of materials and staff to site.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Stagger component delivery to site • The use of mobile batch plants and quarries near the site would decrease the impact on the surrounding road network • Dust suppression must take place on main access road • Reduce the construction period as far as possible • Maintenance of gravel Roads • Apply for abnormal load permits prior to commencement of delivery via abnormal loads • Assess the preferred route (from port of entry to site) and undertake a 'dry run' to test • Staff and general trips should occur outside of peak traffic periods as far as possible. • Any temporary accesses needed for delivery of large plant and equipment (i.e., plant that cannot pass underneath the MV powerlines entering Manganore Substation must: <ol style="list-style-type: none"> 1. Be utilised in such a manner as not to trigger any listed activities in terms of the 2014 EIA regulations. 2. Must be done with the permission of the affected landowner. 3. Be fully rehabilitated as outlined in section 5.20 after use. 	Holder of the EA and EPC Contractor	<p>Implementation in compliance with the actions defined. Implementation of the measures. Implementation of the measured identified in the TIA's.</p> <p>Regular monitoring of road surface quality.</p> <p>Apply for prior to commencement of construction</p>	Throughout the construction phase	ESA and ECO	<p>At commencement of construction</p> <p>Daily</p>	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

This following section provides additional management actions specifically with regards to management of construction vehicles in respect of bio-physical impacts.

Signs must be placed along construction roads to identify speed limit, travel restriction and other standard traffic control information. Furthermore, all construction vehicles should adhere to a low-speed limit to avoid collisions with susceptible faunal species. The following environmental management actions are required.

Impact management outcome: To ensure that construction traffic does not cause faunal fatalities, nor undue damage to vegetation or pollution of the environment.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The designated access to the site must be established and clearly signposted prior to physical construction commencing on site. • Speed limits for main access road should be set at 50km per hour. • Speed limits for internal roads must be set at 25km per hour. • Speed control signage to be placed at intervals along the access road, at the entrance to the site and at intervals along the internal road network. • Temporary signage to be in place for the construction phase. This signage to be replaced with permanent signage for the operational phase. • Other than vehicles and plant required for the drilling and ramming operations, no vehicles or plant may leave the access, or internal road network (except when within the site camp and laydown area) • Dust control (as described below) must be implemented the full length of the access road and on all main internal haul roads. • Any faunal fatalities because of vehicles and plant must be reported to the ESA within 1 hour of the incident. 	EPC Contractor	Implementation in compliance with the actions defined.	Throughout the construction phase	ESA and ECO	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.12 CONSTRUCTION WASTE

An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling and re-use options where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licenced in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).

It is proposed that the local municipality will provide services in terms of waste removal and sewage for the construction phase of the proposed project. However, should the municipality not have adequate capacity available for the handling of waste and sewage, then the EPC Contractor must make use of private contractors to ensure that the services are provided. The EPC Contractor must also ensure that adequate waste disposal measures are implemented by obtaining waste disposal dockets / slips of all waste and sewage that is removed from site.

Impact management outcome: To promote an integrated waste¹⁷ management approach and ensure the management of waste during the construction phase is both lawful and sustainable.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • All recyclable material (such as module packaging, packaging strips, pallets etc) must be recycled and may not be disposed of as part of the normal waste stream. • A dedicated waste management area should be set up in the contractors site camp / laydown area. This waste management area must as a minimum: <ul style="list-style-type: none"> - Be clearly demarcated and sign posted - Be wind and scavenger proof; - Include separation of waste streams (Recyclable waste, General Waste, Construction Rubble and Hazardous Waste); - Be maintained in a neat and tidy state with waste regularly removed. • The EPC Contractor must provide the ESA with a Waste Management register / report on a weekly Basis. This register / report must include as a minimum: <ul style="list-style-type: none"> - Records of all waste volumes for waste stream, - Proof of all volumes of recycling, - Disposal slips for all waste transported to a landfill, - Disposal slips for all hazardous waste, • All hazardous waste (including chemicals, bitumen, fuel, lubricants, oils, contaminated soil from hydrocarbon spills, paints etc.) shall be disposed of at an approved / registered hazardous-waste landfill site. The Contractor shall provide disposal certificates to the ECO. • All Hazardous waste must be temporary stored in sealed waterproof containers and may not be stored on site for longest than 30 days. • Used oil and grease must be removed from site to an approved used oil recycling company. 	EPC Contractor	The EPC contractor to provide method statement for waste management.	Throughout the construction phase	ESA and ECO. EPC Contractor to provide records of all waste volumes and disposal slips on a weekly basis.	Daily	Weekly environmental checklists. Monthly environmental control reports.

- ¹⁷ Waste in this instance excludes excess overburden from excavations.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Under NO circumstances may any waste be spoiled on the site. • Where possible, the routine maintenance of construction plant should take place off-site. Where such maintenance must occur, it must be done in the site camp on an impermeable surface with a sump to collect any oil spills. • Temporary waste receptacles in the field must be removed to the dedicated waste management area before the end of each working day. • Ensure that no waste materials or sediments are left in the surrounding drainage lines (because of the construction). • Wastewater must be collected and disposed of at a suitable licenced disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes 						

5.13 FUEL AND CHEMICAL STORAGE

The above ground storage of fuel is subject to authorisation in terms of the National Environmental Management Act (NEMA EIA regulations) if more than 30m³ is stored on site at any one time. The environmental authorisation for this development does not include authorisation for the storage of more than 30 cubic metres of fuel.

The temporary storage of hazardous or toxic materials / liquids (chemicals, fuels, lubricants and oils) must comply with legislation and the actions in the table below must be implemented.

Impact management outcome: To ensure lawful fuel storage that does not cause soil and water pollution.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Temporary fuel storage must take place within the contractors site camp and laydown area in an area approved by the ECO; • No storage of fuel may take place on any other portion of the site; • 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 immediately in the appropriate manner, as related to the nature of the spill. • Mobile fuel units used to refuel plant on site must make use of drip trays when refuelling; • Storage facilities may not be located within 60m of any freshwater resources where there is a potential for any spilled fuel to enter the resource; • Fuel storage facilities should be located on flat ground. No cut and fill should take place immediately on or adjacent to fuel storage areas; • All storage tanks should be double lined and be ISO 9001 certified; • All storage tanks must be enclosed by bund walls; • Bund walls must be constructed to contain at least 110% of the total capacity of the storage tanks; • Bund walls must be constructed of impermeable material or lined to ensure that petroleum products cannot escape; • A suitable material should be placed in the base of the bund walls to soak up any accidental spillages; • The tanks should be locked and secured when not in use; • Automatic shut-off nozzles are required on all dispensing units; • Storage tanks should be drained within one week of completion of activities (only unused fuel can be used by the contractor on other work sites or returned to the supplier). If the construction program extends over the builder's shutdown, the contractor must ensure that storage tanks are emptied prior to this period; • All storage tanks, containers and related equipment should be regularly maintained to ensure safe storage and dispensing of material. The engineer is to sign off on the condition and integrity of the storage tanks; • Defective hoses, valves and containment structures should be promptly repaired; 	EPC Contractor	The EPC contractor to provide method statement for chemical and fuel storage.	Throughout the construction phase	ESA and ECO. EPC Contractor maintain a fuel and chemical register and provide this to the ECO on a monthly basis.	Daily	Weekly environmental checklists. Monthly environmental control reports.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Vehicle and equipment fuelling should be undertaken on a hard impermeable surface, over drip pans or bund walls to ensure spilled fuel or toxic liquids is captured and cleaned up; The area must be totally rehabilitated on completion of the contract and all contaminated material must be carefully removed and disposed of at a licensed dumping site for that purpose; and Spill kits must be made available on-site for the clean-up of spills. A minimum of 2 spill kits must be in the contractors site camp. Spill kits must also be available in the field within 500m of any drilling and ramming operations. 						

5.14 NOISE MANAGEMENT

Although the proposed development is located outside of an urban area, the following noise management actions are applicable to the construction phase of the development due to its proximity to farm homesteads.

The Contractor shall furthermore be responsible for compliance with the relevant legislation with respect to noise inter alia Section 25 of ECA (73 of 1989) and standards applicable to noise nuisances in the Occupational Health and Safety Act (No. 85 of 1993).

Impact management outcome: To ensure nuisance from noise and vibration does not occur.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> It is recommended that noise generation be kept to a minimum and that construction activities be confined to normal working hours (07:00 - 17:00 on Monday to Saturday). Should the Contractor wish to deviate from these work hours, approval must be granted by the Holder of the EA, 	EPC Contractor	As per the stated actions	Throughout the construction phase	ESA and ECO	Daily	Weekly environmental checklists.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The following noise reduction actions in respect of plant should be implemented: - Provide baffle and noise screens on noisy machines as necessary; - Provide absorptive linings to the interior of engine compartments; - Ensure machinery is properly maintained (fasten loose panels, replace defective silencers); - Switch off machinery immediately when not in use; and - Reduce impact noise by careful handling. 						Monthly environmental control reports.

5.15 CONCRETE MANAGEMENT

Proper concrete management is of utmost importance. Concrete works are likely to be limited to the construction of the on-site sub-station and auxiliary buildings and are not likely to be extensive (the preferred alternative for the panel support structures will make use of a technology that does not require concrete footings, due to rammed piles/earth screws/rock anchors). However, in instances where rammed piles/earth screws or rock anchors will not be practically possible and for other concrete work associated with the substation and inverter stations, the following actions in terms of concrete management should take place.

Cement powder has a high alkaline pH that may contaminate and adversely affect both soil pH and water pH negatively. A rapid change in pH can have consequences on the functioning of soil and water organisms, as well as on the botanical component.

The use of ready-mix trucks delivering concrete directly to site is recommended and mass batching of concrete on site should be limited as far as possible.

Impact management outcome: To ensure that the handling of concrete does not result in pollution of soil or water resources.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Trucks should deliver pre-mixed concrete to the site and pour the concrete directly into the prepared excavations. • When concrete trucks have unloaded, there is a requirement to wash out the inside of the concrete drum. Water can be provided to the trucks for this purpose (at the discretion of the contractor). Concrete suppliers may NOT dispose of this wash water anywhere on site. Trucks should return to their depot for this purpose. • Any spillages of concrete outside of the excavations (including haulage routes) must be cleaned up immediately by the supplier. • Where small batching of concrete or plaster takes place on site, the following actions must be implemented: <ul style="list-style-type: none"> - Concrete batching may only take place in areas approved by the ECO (preferably in the Site Camp); - Concrete mixing must take place on batching plates unless it is on an area that is to be hard surfaced as part of the development; - Equipment (wheelbarrows, shovels etc) must be washed into a lined settling pond; - Once the settling ponds dry out, the concrete must be removed and dispatched to a suitable disposal site. Ideally, all concrete batching should take place on an area that is to be hard surfaced as part of the development (building floor, road or paved area); • To avoid resource contamination, concrete batching should not be located within 60m of any stormwater management structure. • If an area outside of the site camp is identified for batching it must first be approved by the ECO and all topsoil must be stripped and stockpiled for re-use. • Batching at satellite sites must be done on a batching plate to prevent soil contamination. • Empty cement bags must be treated as hazardous waste and must be treated accordingly. • Cement wash water may not be discharged into the environment. 	EPC Contractor	The EPC contractor to provide method statement for all on site concrete batching.	Throughout the construction phase	ESA and ECO	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

5.16 FIRE MANAGEMENT AND PROTECTION

As required in the veld and fire management act, it is the landowner's responsibility to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires. This requirement will fall on the lawful user of the land in respect of the PV Development.

The PV development site is arid, with sparse vegetation cover and fires are not a natural phenomenon in the area. However, under exceptional circumstances, such as following years of exceedingly high rainfall, sufficient biomass may build up to carry fires. Therefore, management of plant biomass within the site should be part of the management of the facility. Grazing by livestock is the simplest and most ecologically sound way to manage plant biomass and is recommended the preferred method to manage plant biomass at the site if found to be viable. Alternative management practices can include brush cutting. Utilisation of non-selective herbicides for the management of biomass is prohibited on site. The following environmental impact management actions must be implemented with regards to fire management.

Impact management outcome: To reduce the risk of fire to infrastructure and environment.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Fires should only be allowed within fire-safe demarcated areas (and only within the site camp); No fuelwood collection is allowed on-site; The total removal of all invasive alien vegetation should take place to decrease the fire risk – Although there were few invasive plants identified during the environmental process, these may establish to a degree as a result of site disturbance. This must be done in accordance with the Alien Vegetation Management Plan; Cigarette butts may not be thrown in the veld but must be disposed of correctly. The contractor, must designate smoking areas (in compliance with the Tobacco Products Control Amendment Act 63 of 2008) with suitable receptacles for disposal; In case of an emergency, the contact details of the local fire and emergency services must be readily available; 	EPC Contractor	In compliance with the actions defined as well as requirements detailed in the health and safety plan.	Throughout the construction phase	ESA and ECO	Daily	Weekly environmental checklists. Monthly environmental control reports.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Contractors must ensure that basic firefighting equipment and suitably qualified/experienced personnel are available on site at all times, 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 pre-construction compliance workshop and the environmental induction training prior to commencement of construction; Biomass from the removal of woody vegetation currently present on site should be chipped to reduce its flammability, and The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection. 						

5.17 SANITATION

The EPC must provide sanitation facilities within the construction area and along the road so that workers do not pollute the surrounding environment. These facilities must be removed from the site when the construction phase is completed. Associated waste must be disposed of at a registered waste disposal site.

Impact management outcome: To ensure safe and healthy sanitation for construction staff without increasing pollution risk.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<p>Portable chemical ablution facilities must be made available for the use by construction staff for the duration of the construction period. The following actions must be implemented in this regard:</p> <ul style="list-style-type: none"> Toilet and washing facilities must be available to the site personnel at all times (at the site camp and in the field); These facilities must be situated away from freshwater resources; One toilet for every 15 personnel is required; 	EPC Contractor	As per the stated actions	Throughout the construction phase	ESA and ECO. The EPC Contractor to supply chemical	Daily	Weekly environmental checklists. Monthly environmental control reports.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The facilities must be serviced on a regular basis to prevent any overflow or spillage; • The servicing contractor must dispose of the waste in an approved manner (e.g., via the municipal wastewater treatment system); • The ECO must be provided with the service providers' details and the service schedule for the site; • The toilets should be secured to ensure that they do not blow over in windy conditions; • All toilet facilities must be removed from site on completion of the contract period, and; • Should the construction period be interrupted by a builder's break, the toilets should be emptied prior to the break. 				toilet service records to the ESA on a weekly basis.		

Sanitation during operation is discussed separately in the sections below.

5.18 BLASTING ACTIVITIES

Since the PV panel mountings will be drilled / rammed into the earth and will thus not require extensive excavation for foundations, it is therefore unlikely that blasting will be required. Should blasting be required for whatever reasons, the following actions must be implemented:

Impact management outcome: To ensure any blasting activities do not disturb sensitive environmental nor social features.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • No blasting may take place within 50m of a borehole without approval of a suitably qualified engineering geologist. Preventative mitigation actions could include installing PVC casing and screens in potentially affected boreholes before blasting, while damaged boreholes will have to be re-drilled; • A current and valid permit shall be obtained from the relevant authorities prior to any blasting activity; • A method statement shall be required for any blasting related activities; • All laws and regulations applicable to blasting activities shall be adhered to at all times; • A qualified and registered blaster shall supervise all blasting and rock splitting operations at all times; • The contractor shall ensure that appropriate pre-blast monitoring records are in place (i.e., photographic and inspection records of structures in close proximity to the blast area); • The contractor shall allow for good quality vibration monitoring equipment and record keeping on site at all times during blasting operations; • The contractor shall ensure that emergency services are notified, in writing, a minimum of 24 hours prior to any blasting activities commencing on site; • The contractor shall take necessary precautions to prevent damage to unique features and the general environment, which includes the removal of fly-rock. Environmental damage caused by blasting / drilling shall be repaired at the contractor's expense to the satisfaction of the ECO; • The contractor shall ensure that adequate warning is provided immediately prior to all blasting. All signals shall also be clearly given; • The contractor shall use blast mats for cover material during blasting. Topsoil may not be used as blast cover; • During demolition, the contractor shall ensure, where possible, that trees in the area are not damaged; • Appropriate blast shaping techniques shall be employed to aid in the landscaping of blast areas, and a method statement to be approved by the Engineer, shall be required in this regard; and • At least one week prior to blasting, the relevant occupants/owners of surrounding land shall be notified by the contractor and any concerns 	EPC Contractor	The EPC contractor to provide method statement for blasting activities should they be needed.	Throughout the construction phase	ESA and ECO.	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
addressed. Buildings within the potential damaging zone of the blast shall be surveyed, preferably with the owner present and any cracks or latent defects pointed out and recorded either using photographs or video. Failing to do so shall render the contractor fully liable for any claim of whatsoever nature, which may arise. The contractor shall indemnify the employer in this regard.						

5.19 THEFT AND ENVIRONMENTAL CRIME

An increase in crime during the construction phase is often a concern. In the case of this development, the risk is likely to be low due to the remote nature of the site. Theft and other crime associated with construction sites is not only a concern for surrounding residents, but also the developer and the contractor. Considering this, contractors need to be proactive in order to curtail theft and crime on and resulting from the construction site.

It is recommended that the contractor develop a jobsite security plan prior to commencement of construction. This jobsite security plan should consider protection of the construction site from both internal and external crime elements, as well as the protection of surrounding communities from internal crime elements. All incidents of theft or other crime should be reported to the South African Police Service, no matter how seemingly insignificant. A copy of the jobsite security plan should be included in the first environmental control report to be submitted to the competent authority.

It is likely that the Contractor's Site Camp and the PV Laydown area/s will be fenced with a temporary fence to avoid theft during construction. Additional security measures during construction may include CCTV camera surveillance and security guards.

Impact management outcome: To ensure that activities on site do not increase the criminal activity of the area.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> The following actions are relevant in this regard (refer to the section above for details of the facility permanent security fencing): The EPC Contractor must develop a Job Site Security Plan for the project. All portable construction equipment and material must be locked away within the Contractor's Site Camp overnight and during holiday periods; Fuel storages tanks must be locked when not in use; All unassembled / un-installed PV materials must be locked within the fenced Laydown areas overnight and during holiday periods. The minimum amount of lighting should be used at night, and this should be of the low-UV emitting kind that attracts less insects. The collection, hunting or harvesting of any plants or animals at the site is strictly forbidden, and thus any person found undertaking any of these actions will be considered guilty of committing a crime. Any incidents of such crimes on nature must be reported to the ECO immediately, who will report the incident to the SAPS. 	EPC Contractor	Implementation of a Job site security plan to be compiled by the EPC.	Jobsite Security Plan to be prepared prior to site establishment Throughout the construction phase	ESA and ECO.	Daily	Weekly environmental checklists. Monthly environmental control reports.

5.20 REHABILITATION AND HABITAT RESTORATION

A detailed Rehabilitation and Habitat Restoration Plan must be compiled by a specialist prior to commencement of any construction activities.

One of the primary objectives of all the previously listed impact management outcomes are to avoid and reduce impact on the receiving environment, thus minimising the rehabilitation and restoration requirements on completion of construction. The EPC contractor must be mindful of this primary objective as part of all activities taking place on site.

Impact management outcome: To restore habitat disturbed during construction activities

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<p>Topsoil management</p> <ul style="list-style-type: none"> • Effective topsoil management is a critical element of rehabilitation, particularly in arid and semi-arid areas where soil properties are a fundamental determinant of vegetation composition and abundance. Although some parts of the site consist of exposed bedrock, most parts of the site have at least some topsoil. Where any excavation or topsoil clearing is required, the topsoil should be stockpiled and later used to cover cleared and disturbed areas once construction activity has ceased. • Excess inert material and other disturbed areas should be reshaped to blend in with the natural contours of the area; • The contractor must be mindful that insufficient topsoil be available for rehabilitation purposes, additional topsoil will need to be sourced from a commercial source at a cost to the contractor. • Topsoil is the top-most layer (0-30cm) of the soil in undisturbed areas. This soil layer is important as it contains nutrients, organic matter, seeds, micro-organisms, fungi and soil fauna. All these elements are necessary for soil processes such as nutrient cycling and the growth of new plants. The biologically active upper layer of the soil is fundamental in the maintenance of the entire ecosystem. • Topsoil should be retained on site in order to be used for site rehabilitation. The correct handling of the topsoil (as detailed earlier in the report) is a key element to rehabilitation success. Firstly, it is important that the correct depth of topsoil is excavated. If the excavation is too deep, the topsoil will be mixed with sterile deeper soil, leading to reduction in nutrient levels and a decline in plant performance on the soil. • Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods. • If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible. The longer 	EPC Contractor	<p>Implementation of the actions detailed here.</p> <p>Provision of a sufficient budget to undertake rehabilitation activities</p>	<p>Throughout the construction phase.</p> <p>Physical rehabilitation activities to be completed prior to contractual operations date.</p>	ESA and ECO and Rehabilitation Specialist	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<p>the topsoil is stored, the more seeds, micro-organisms and soil biota are killed.</p> <ul style="list-style-type: none"> Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil. <p>Ripping & Substrate preparation</p> <ul style="list-style-type: none"> Before commencement with restoration activities detailed below, all identified rehabilitation areas that are compacted as a result of construction activities must be mechanically ripped. Imported gravel layers (such as in the laydown area and site camp) must be removed prior to ripping and commencing with rehabilitation. <p>Mulching</p> <ul style="list-style-type: none"> Mulching is the covering of the soil with a layer of organic matter of leaves, twigs bark or wood chips, usually chopped quite finely. The main purpose of mulching is to protect and cover the soil surface as well as serve as a source of seed for revegetation purposes. During site clearing the standing woody vegetation should not be cleared and burned, removed or mixed with the soil, but should be cleared separately¹⁸. The cleared vegetation should be stockpiled and used whole or shredded by hand or machine to protect the soil in disturbed areas and promote the return of indigenous species. Where there is a low shrub or grass layer, this material can be cleared and mixed as part of the topsoil (or applied as a top mulch) as this will aid revegetation and recovery when it is reapplied. All mulch should be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-Dring alien invasive plants; 						

¹⁸ Woody vegetation within the PV array should not be mechanically cleared, but rather slashed with a brush-cutter or by hand.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • No harvesting of vegetation may be done outside the area to be disturbed by construction activities; • Brush-cut mulch should be stored for as short a period as possible, and seed released from stockpiles can also be collected for use in the rehabilitation process. <p>Seeding</p> <ul style="list-style-type: none"> • In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required as directed by the ECO. • Seed should be collected from plants present at the site and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch. • Indigenous seeds may be harvested¹⁹ for purposes of re-vegetation in areas that are free of alien or invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites; • Seed may be harvested by hand and if necessary dried or treated appropriately; • No seed of alien or foreign species should be used or brought onto the site. <p>Transplants</p> <ul style="list-style-type: none"> • Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. This can be an effective means of establishing indigenous species quickly, this is however unlikely to be a viable option at the current site as there are few suitable species present, but if the conditions are wet then most species have some probability of surviving. 						

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- ¹⁹ Any seed harvesting required must be done with the appropriate permits in place.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Plants for transplant should only be removed from areas that are going to be cleared. • Perennial grasses, shrubs, succulents and geophytes are all potentially suitable candidates for transplant. • Transplants should be placed within a similar environment from where they came in terms of aspect, slope and soil depth. • Transplants must remain within the site and may not be transported off the site. • Some species can also grow from cuttings and branches of many succulent species can be rooted in the field. <p>Use of soil savers</p> <ul style="list-style-type: none"> • On steep slopes (unlikely on the development site) and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are synthetic materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed. • In areas where soil saver is used, it should be pegged down to ensure that it captures soil and organic matter flowing over the surface. • Soil saver may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination. Alternatively, fresh mulch containing seed can be applied to the soil saver. <p>General recommendations</p> <p>Progressive rehabilitation is a crucial element of the rehabilitation strategy and should be implemented where feasible.</p> <ul style="list-style-type: none"> • Once re-vegetated, areas should be protected to prevent trampling and erosion. • No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated. • Where rehabilitation sites are located within actively grazed areas, they should be fenced. • Fencing should be removed once a sound vegetative cover has been achieved. 						

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Any runnels, erosion channels or washaways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition. 						

As highlighted in the introduction to this section, the most cost-effective way to reduce the cost and effort for rehabilitation is to reduce and minimise the disturbance footprint. The installation of the panel arrays without total clearing site (i.e., only the physical removal of the woody species), is the biggest benefit that can be applied in this regard.

The PV panels and roads within the development represent hard surfaces that will generate a lot of runoff. As a result, effective runoff management is essential as is an effective vegetation cover to prevent widespread erosion across the site.

5.21 FAUNAL MANAGEMENT

Impact management outcome: To reduce the direct impact on animals affected by the construction activities.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Any animals (including snakes, tortoises and lizards) directly threatened by the clearing or construction activities should be removed to a safe location outside of the construction area by the ECO or other suitably qualified/experienced person. All trenches, open excavations and fence lines should be inspected daily (first thing in the morning) for any trapped fauna (particularly small mammals and reptiles). These should be removed to a safe location outside of the construction area by the ECO or other suitably qualified / experienced person. Faunal ladders to be installed in all temporary water storage areas. 	EPC Contractor	Implementation of the actions detailed here.	Throughout the construction phase.	ESA and ECO.	Daily	Weekly environmental checklists. Monthly environmental control reports.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> The development footprint may need to be flushed prior to completion of the perimeter fence to ensure that no large mammals become trapped within the development site. All faunal mortalities are to be reported to the ESA, who must maintain a register of faunal mortalities. The ESA must maintain a register of all faunal observations within the development site. 						

5.22 HERITAGE FEATURES

Should any archaeological sites, artefacts, palaeontological fossils or graves be exposed during construction work, work in the immediate vicinity of the find must be stopped, SAHRA must be informed, and the services of an accredited heritage professional obtained.

Impact management outcome: Impact to heritage resources is minimised.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure detailed above; Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; All work in a specific area must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that a systematic and professional investigation can be 	EPC Contractor	<p>Implementation of the actions detailed here.</p> <p>Implementation of chance find procedure.</p>	Throughout the construction phase.	ESA and ECO.	Daily	<p>Weekly environmental checklists.</p> <p>Monthly environmental control reports.</p>

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
undertaken. Sufficient time must be allowed to remove/collect such material before development recommences in that area.						

6. OPERATIONAL PHASE – IMPACT MANAGEMENT OUTCOMES AND ACTIONS

This section provides details on the operational phase impact management outcomes and actions²⁰ that are commonly applicable to the operation of a PV Energy Facility and its associated infrastructure, as well as management actions outlined by participating specialists and those contained in the EA for the facility.

Each subsection includes an aspect identified for the development of a PV Energy Facility, and for each aspect a set of prescribed impact management outcomes and associated impact management actions have been identified.

The holder of the EA is ultimately responsible to ensure the implementation of these outcomes and actions.

Written notice of intent to commence operations must be submitted to the DFFE at least 14 days prior to the commencement of operations.

6.1 CLEANING OF PV MODULES

Any rainfall on the solar panels would be welcomed due to its cleaning effect, but as mentioned before, the annual predicted rainfall is extremely low. Water for cleaning panels should take place using water from lawful sources and can be supplemented from the rainwater collection / storage systems on site. To further reduce the use of water at the solar facility, the use of alternative panel cleaning methods could be investigated.

Impact management outcome: To ensure that cleaning of PV modules is lawful, resource efficient and does not cause erosion or pollution of the surrounding environment.

• ²⁰ All Environmental Management Actions allocated to the O&M contractor will apply equally to all sub-contractors responsible for any specific task.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Water for the cleaning of PV modules must be lawful. • Only clean water or biodegradable cleaning materials may be used for washing purposes. • Care should be taken that the wash-water does not cause any erosion (the use of labour intensive, or high pressure/low volume techniques is recommended in this regard). • Water used in the cleaning process is likely to encourage the growth of natural vegetation around the panel arrays and rows, which will require routine brush-cutting / trimming to avoid vegetation shading the panels, interfering with tracking mechanisms or the risk of fires. Under no circumstances should vegetation beneath or around the panel arrays and rows be cleared / removed entirely, as this will result in significant erosion and associated sandblasting of infrastructure. Due to stunted nature of the xerophytic vegetation, it is unlikely that this will need to be done often. Biomass produced from these trimming activities could be chipped and used as mulch under the PV panels (to increase stormwater infiltration and reduce erosion). • The management of a vegetated cover on as much of the site as possible must take place. This will reduce fugitive dust emissions and thus cleaning frequencies. • Where practical, adopt “dry” cleaning methods, such as dusting and sweeping the site before washing down. • Low level and ongoing cleaning of PV panels over time to reduce demand on aquifers. 	O&M Contractor	Implementation of the actions detailed in this section.	Throughout the Operational Phase	O&M Contractor Audit consultant.	Daily by O&M Contractor. Annually as part of operational environmental audits	Operational Environmental Audit Report.

6.2 OPERATIONAL WASTE

During the operational phase of the development, the amount of waste generated is likely to be very minimal and limited to normal domestic waste generated in the office, workshop waste from maintenance activities and damaged PV modules.

It is proposed that the local municipality will provide services in terms of waste removal and sewage for the operational phase (excluding Hazardous Waste and damaged PV Modules) of the proposed project. However, should the municipality not have adequate capacity available for the handling of waste and sewage;

then the O&M Contractor must make use of private contractors to ensure that the services are provided. The O&M Contractor must also ensure that adequate waste disposal measures are implemented by obtaining waste disposal dockets / slips of all waste and sewage that is removed from site.

Impact management outcome: To promote an integrated waste²¹ management approach and ensure the management of waste during the construction phase is both lawful and sustainable

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Wind and scavenger proof bins must be installed at the maintenance / control buildings and on-site substation and must be emptied on a weekly basis • All hazardous waste (including bitumen, fuel, oils, paints etc.) used during the operation and maintenance of the solar facility shall be disposed of at an approved/registered hazardous-waste landfill site. The contractor responsible for the disposal shall provide disposal certificates to the site manager. • Used oil and grease must be removed from site to an approved used oil recycling company. • Under NO circumstances may any hazardous waste be spoiled on the site. • The servicing of operation/maintenance vehicles may not take place on site. • Damaged PV modules should be stored in a designated area within the O&M complex before being returned to supplier²² for recycling. • Biomass from vegetation management activities must not be disposed of off-site but must be utilised as mulch as part of the ongoing rehabilitation²³. • Wastewater must be collected and disposed of at a suitable licenced disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes 	O&M Contractor	Implementation of the actions detailed in this section.	Throughout the Operational Phase	O&M Contractor to implement and maintain records. Audit consultant.	Daily by O&M Contractor. Annually / three yearly as part of operational environmental audits	Operational Environmental Audit Report.

• ²¹ Waste in this instance excludes excess oils that may be spilled because of transformer failure. Such an incident is discussed separately under the Hazardous Substances, Leakage and Spillage Plan below.

• ²² Or third-party recycler.

• ²³ This Biomass can be chipped should the volumes be high enough as to pose a fire risk.

6.3 OPERATIONAL GENERAL ECOLOGY CONSIDERATIONS

This section provides general management actions to ensure that operational activities do not degrade the ecological functioning of the site.

Impact management outcome: Ensure that operational activities do not degrade the ecological functioning of the site.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Dust control should be continued into operation. Any trimming of protected species that may establish under the modules must be done in accordance with a permit. Other than the maintenance of the vegetated layer under the PV modules, NO further clearing of vegetation should take place. Speed limits within the facility must be maintained and enforced. Specialist advice to be sought for the management of any fauna that establishes within the site during operations. The O&M contractor must monitor and report any Avifaunal Mortalities as a result of collision, entrapment or electrocution by project Infrastructure. 	O&M Contractor	Implementation of the actions detailed in this section.	Throughout the Operational Phase	O&M Contractor to implement and maintain records. Audit consultant.	Daily by O&M Contractor. Annually / three yearly as part of operational environmental audits	Operational Environmental Audit Report.

6.4 GENERAL OPERATIONAL MAINTENANCE

The section in the table below details general operational maintenance environmental impact management actions that are not covered in the sections above.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • Lubricants used to grease bearing of panel tracking systems should be conservatively used to avoid leakage or spills. Any leaks or spills that occur during maintenance operations must be cleaned up immediately and the contaminated soil / material disposed on at a registered disposal site for hazardous materials. • The tracks / pathways between the PV panel rows used for cleaning and maintenance of the panels, should be maintained as single tracks and regularly brush-cut and/or mowed to allow reasonable access. • Access roads and the internal road network must be maintained in a condition that allows for reasonable access and minimised erosion potential. All drainage, stormwater management and erosion control structures must be maintained to ensure their proper functioning. • Regular monitoring for erosion to ensure that no erosion problems are occurring at the site because of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible. • All maintenance vehicles to remain on the demarcated roads. • The conservancy tank, associated with the ablution facilities at the on-site sub-station / maintenance buildings, must be maintained in full working condition. • The perimeter security fence should be routinely patrolled to ensure that it still allows for the passage of small and medium sized mammals, at least at strategic places, and that the electrified strands are not causing animal electrocution. • No unauthorized persons should be allowed onto the site. • The maintenance of the transmission line infrastructure must retain the bird-friendly design features (bird-flappers and insulation). Any bird electrocution and collision events that occur should be recorded, including the species affected and the date. If repeated collisions occur within the same area, then further mitigation and avoidance measures may need to be implemented. • Staff present during the operational phase should receive environmental education to ensure that no hunting, killing or harvesting of plants and animals occurs. 	O&M Contractor	Implementation of the actions detailed in this section.	Throughout the Operational Phase	O&M Contractor to implement and maintain records. Audit consultant.	Daily by O&M Contractor. Annually / three yearly as part of operational environmental audits	Operational Environmental Audit Report.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> All alien plants present at the site should be controlled at least twice a year using the best practice methods for the species present. Bare soil should be kept to a minimum, and at least some grass or low shrub cover should be encouraged under the panels. No pets should be allowed within the solar facility. 						

6.5 AVIFAUNAL MANAGEMENT

The following avifaunal impact management actions must be implemented during the operational phase.

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
Avifauna: Displacement due to habitat transformation					
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance and the presence of the solar PV plant and associated infrastructure.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented, according to the recommendations of Avifaunal specialist study.	Implementation of the Habitat Restoration Plan	EPC or appointed contractor to provide report	Once-off Once a year As and when required	Project developer Facility Environmental Manager Project developer and facility operational manager
Avifauna: Mortality due to electrocution					
Electrocution of priority avifauna in the onsite substation or inverter station.	Prevention of ongoing electrocution of avifauna through reactive mitigation if necessary, depending on the gravity of the problem.	Implementation of mitigation measures such as insulation of live parts to prevent further electrocutions.	Site investigation to determine causes of the mortality. Implementation of appropriate measures e.g., insulation of live parts with appropriate products.	As and when required	Facility Environmental Manager Facility operational manager

7. ALIEN INVASIVE VEGETATION MANAGEMENT PLAN

Alien Invasive Vegetation Management Plan must be compiled by an Ecological Specialist prior to commencement of construction activities.

8. PLANT RESCUE AND PROTECTION PLAN / RE-VEGETATION AND HABITAT REHABILITATION PLAN

A Plant Rescue and protection Plan must be compiled by an Ecological Specialist prior to the commencement of construction.

9. OPEN SPACE MANAGEMENT PLAN

An Open Space Management Plan must be compiled by an Ecological Specialist prior to commencement of construction.

10. HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM

The following hazardous substances leakage or spillage monitoring system must be adopted and implemented.

Impact	Environmental Impact Management Action.	Monitoring		
		Methodology	Frequency	Responsibility
Contamination of soil and risk of damage to vegetation and/or fauna through spillage of concrete and cement.	If any concrete mixing takes place on site, this must be carried out in a clearly marked, designated area at the site camp on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface).	Monitor the handling and storage of sand, stone and cement as instructed.	Daily	Holder of the EA, EPC contractor and ECO.
	Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains.	Monitor the handling and storage of sand, stone and cement as instructed.	Daily	Holder of the EA, EPC contractor and ECO.
	A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted.	Monitor the handling and storage of sand, stone and cement as instructed.	Daily	Holder of the EA, EPC contractor and ECO.
	Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal	Monitor the handling and storage of sand, stone and cement as instructed.	Daily Monthly	Holder of the EA, EPC contractor and ECO.

Impact	Environmental Impact Management Action.	Monitoring		
		Methodology	Frequency	Responsibility
	facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.	Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.		
	Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Empty cement bags must be collected from the construction area at the end of every day. Sand and aggregates containing cement must be kept damp to prevent the generation of dust.	Monitor the handling and storage of sand, stone and cement as instructed.	Daily	Holder of the EA, EPC contractor and ECO.
	Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed at a licenced waste disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.	Monitor the handling and storage of sand, stone and cement as instructed. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	Daily Monthly	Holder of the EA, EPC contractor and ECO.
Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils.	Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the site camp. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel).	Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.	Weekly	EPC Contractor and ECO
	Monitor and inspect construction equipment and vehicles to ensure that no fuel spillage takes place. Ensure that drip trays are provided for construction equipment and vehicles as required.	Monitor the construction equipment and vehicles and monitor the occurrence of spills and the management process thereof. Record all spills and lessons learnt.	Daily During spill events	EPC Contractor and ECO
	Contractor to compile a Method Statement for refuelling activities under normal and emergency situations. If on-site servicing and refuelling is required in emergency situations, a designated area must be created at the construction site camp for this purpose. Drip trays ²⁴ or similar impervious materials must be used during these procedures.	Verify if a Method Statement is compiled by reviewing approved and signed off reports. Monitor the refuelling/ servicing process and record the occurrence of any spillages.	Once-off prior to commencement of construction. During emergency refuelling and servicing activities.	ECO

- ²⁴ In addition to the requirement to utilise a drip tray during refuelling, drip trays must be placed under all plant when it is not in use, regardless of whether this plant in the field or at the site camp.

Impact	Environmental Impact Management Action.	Monitoring		
		Methodology	Frequency	Responsibility
	Spilled fuel, oil or grease must be retrieved, and contaminated soil removed, cleaned and replaced.	Monitor the handling and storage of fuels and oils via site audits and monitor if spillages have taken place and if so, are removed correctly. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	Daily (or during spills)	EPC Contractor and ECO
	Contaminated soil to be collected by the Contractor (under observation of the ECO) and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.	Monitor the correct removal of contaminated soil. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	Daily (or during spills)	EPC Contractor and ECO
	A Spill Response Method Statement must be compiled by the Contractor for the construction phase to manage potential spill events.	Compile a Spill Response Method Statement. Audit signed and approved Spill Response Method Statement.	Once-off (and thereafter updated as required during the construction phase). Once-off (and thereafter as required during the construction phase).	Holder of the EA, EPC contractor and ECO.
	The Contractor must ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events.	Monitor via site audits and record incidents and non-compliance.	Daily/Weekly	ECO and EPC Contractor
	Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.	Ensure that a well-maintained portable bioremediation kit is available on site and that construction personnel and contractors are aware of its location and instructions	Daily	EPC Contractor and ECO
	In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is significantly contaminated, a specialist will need to be immediately appointed to address the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e., GN 331). If the soil is determined to be significantly	Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e., GN 331) to determine if the soil is significantly contaminated or not. If the contaminated soil is significantly contaminated, then compliance with	During spill events	Holder of the EA

Impact	Environmental Impact Management Action.	Monitoring		
		Methodology	Frequency	Responsibility
	contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Environmental Affairs of the significant contamination.	Part 8 of the NEMWA should be achieved by the Applicant.		
	The Contractor must record and document all significant spill events.	Monitor documentation and records of significant spill events via audits and record non-compliance and incidents.	During spill events	ECO
Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils	Monitor and inspect maintenance equipment and vehicles to ensure that no fuel spillage takes place.	Implement specifications for maintenance equipment use as specified by the maintenance Contractor.	Monthly	Holder of the EA
	Spilled fuel, oil or grease is retrieved during operations where possible and contaminated soil removed, cleaned and replaced.	Monitor the handling and storage of fuels and oils via site audits and monitor if spillages have taken place and if so, are removed correctly. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	During spills	Holder of the EA
	Contaminated soil to be collected by the Contractor and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.	Monitor the correct removal of contaminated soil. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	During spills	Holder of the EA
	A Spill Response Plan must be compiled for the operational phase to manage potential spill events.	Compile a Spill Response Plan. Audit signed and approved Spill Response Method Statement.	Once-off (and thereafter updated as required). Once-off (and thereafter as required).	Holder of the EA and Facility Manager
	Ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events. Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.	Ensure that a well-maintained portable bioremediation kit is available on site and that operational	Weekly	Facility Manager

Impact	Environmental Impact Management Action.	Monitoring		
		Methodology	Frequency	Responsibility
		personnel are aware of its location and instructions.		
	In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is significantly contaminated, a specialist will need to be immediately appointed to address the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e., GN 331). If the soil is determined to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Environmental Affairs of the significant contamination.	Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e., GN 331) to determine if the soil is significantly contaminated or not. If the contaminated soil is significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant.	During spill events	Holder of the EA
	Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the PV facility. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel).	Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.	Weekly	Facility Manager
Impacts due to management solid and liquid wastes disposed of on the site during operational phase.	All operation waste to be removed from the site by an appointed service provider.	Waste removal and disposal to be monitored throughout operation.	Monthly	Facility Manager
	All liquid waste or spills (used oil, paints, lubricating compounds and grease from vehicles passing through the entrance facility) to be packaged and disposed appropriately at a registered landfill site.	Monitor the correct removal of liquid waste or spills. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	During spills	Holder of the EA
	Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided to avoid spillages.	Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.	Weekly	Facility Manager

11. STORMWATER MANAGEMENT AND EROSION MANAGEMENT PLAN

The Stormwater Management Plan appended to this EMP must be adopted and Implemented.

12. FIRE MANAGEMENT PLAN

The following Fire Management Plan must be adopted and implemented.

The PV development site is arid, with sparse vegetation cover and fires are not a natural phenomenon in the area. However, under exceptional circumstances, such as following years of exceedingly high rainfall, sufficient biomass may build up to carry fires. Therefore, management of plant biomass within the site should be part of the management of the facility. Grazing by livestock is the simplest and most ecologically sound way to manage plant biomass and is recommended the preferred method to manage plant biomass at the site if found to be practical. Alternative management practices can include brush cutting. Utilisation of non-selective herbicides for the management of biomass is prohibited on site. The following environmental impact management actions must be implemented with regards to fire management.

Impact management outcome: To reduce the risk of fire to infrastructure and environment.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> Fires should only be allowed within fire-safe demarcated areas (and only within the site camp); No fuelwood collection is allowed on-site; 	EPC Contractor	In compliance with the actions defined as well as requirements detailed in the health and safety plan.	Throughout the construction phase	ESA and ECO	Daily	Weekly environmental checklists.

Impact Management Actions	Responsible person	Method of implementation	Timeframe for implementation	Responsible party for monitoring	Frequency of monitoring	Evidence of compliance
<ul style="list-style-type: none"> • The total removal of all invasive alien vegetation should take place to decrease the fire risk – Although there were few invasive plants found during the environmental process, these may establish to a degree as a result of site disturbance. This must be done in accordance with the Alien Vegetation Management Plan; • Cigarette butts may not be thrown in the veld but must be disposed of correctly. The contractor, must designate smoking areas (in compliance with the Tobacco Products Control Amendment Act 63 of 2008) with suitable receptacles for disposal; • In case of an emergency, the contact details of the local fire and emergency services must be readily available; • Contractors must ensure that basic firefighting equipment and suitably qualified/experienced personnel are available on site at all times, 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 pre-construction compliance workshop and the environmental induction training prior to commencement of construction; • Biomass from the removal of woody vegetation currently present on site should be chipped to reduce its flammability, and • The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection. 						Monthly environmental control reports.

13. SPECIALIST ENVIRONMENTAL MANAGEMENT OUTCOMES

During the Environmental Impact Assessment Process, the participating specialists identified the following Environmental Impact Management Outcomes and actions that need to be implemented to ensure the post mitigation impact ratings are achieved.

Terrestrial Ecology

14. SPECIALIST MANAGEMENT PLAN

The aim of the management outcomes is to present the mitigations in such a way that they can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring. **Error! Reference source not found.** presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial assessment.

14.1 TERRESTRIAL ECOLOGY

The focus of mitigation measures is to reduce the significance of potential impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities and the ecologically sensitive areas in the vicinity of the project area;
- As far as possible, reduce the negative fragmentation effects of the development and enable safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of faunal species and community (including potentially occurring species of conservation concern).

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. Brush cutting of vegetation beneath the panels should be, implemented, otherwise controlled grazing by small livestock like sheep. No topsoil stripping or complete vegetation removal beneath the panels. No imported material to be placed under the modules.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
All laydown, chemical toilets etc. should be restricted to low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Operational and Decommissioning phase	Environmental Officer & Contractor	Woody material around footprint	During Phase
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals for cleaning of panels during the operational phase	Life of operation	Environmental Officer & Design Engineer	Water Quality and presence of erosion	Ongoing
It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be compiled and implemented to restrict the impact fire might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Rocks removed in the construction phased may not be dumped, but can be used in areas where erosion control needs to be performed	Operational phase	Environmental Officer & Contractor	Rock piles	During Phase
Any individual of the nationally protected trees or protected plants that was observed needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Preferably, the trees/plants can be relocated within the property without a permit or otherwise left unharmed. Hi visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.	Life of operation	Project manager, Environmental Officer Lodge Manager	Protected Tree/Plant species	Ongoing
The Solar panel surfaces may not have reflective surfaces which can lead to veld fires	Operational phase	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments,	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
<ul style="list-style-type: none"> Signs must be put up to enforce this 				
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed <ul style="list-style-type: none"> Signs must be put up to enforce this; 	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods or louvres to also be used to reduce light spill	Construction Phase	Environmental Officer & Design Engineer	Light pollution	Ongoing
Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna	Life of operation	Environmental Officer & Contractor	Heat generated by substations	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation
Any holes/deep excavations must be dug and planted in a progressive manner; Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Ensure that cables and connections are insulated successfully to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Fencing mitigations: <ul style="list-style-type: none"> • Top 2 strands must be smooth wire • Routinely retention loose wires • Minimum 30cm between wires • Place markers on fences 	Planning, construction and operation	Environmental Officer & Contractor, Engineer	Monitor fences for slack wires	Ongoing
Any exposed parts must be covered (insulated) to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
Management outcome: Alien species				
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
An alien management plan must be implemented quarterly for 2 years after phase	Construction phase and Decommissioning phase	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly for 2 years after phase
Management outcome: Dust				
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces. <ul style="list-style-type: none"> • No non environmentally friendly suppressants may be used as this could result in pollution of water sources 	Life of operation	Contractor	Dustfall	Dust monitoring program.
Management outcome: Waste management				
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days
Management outcome: Environmental awareness training				
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Management outcome: Erosion				
Speed limits must be put in place to reduce erosion. <ul style="list-style-type: none"> Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds; Signs must be put up to enforce this. 	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
A stormwater management plan must be compiled and implemented.	Life of operation	Project manager, Environmental Officer	Management plan	Before construction phase: Ongoing

14.2 AVIFAUNA

- At least one additional pre-construction survey is recommended, consisting of a minimum of 2 days which is necessary to inform the final EMP during operation. The survey should coincide with the peak wet season when most of the nearby 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.
- A post-construction survey during operation (with a minimum of 2-3 x 3 day surveys during a six month period (including the peak wet season)). The surveys aim to obtain mortality data from birds colliding with the panels to advise on appropriate mitigation measures to be implemented to reduce potential bird mortalities. The surveys should be conducted in a regular and systematic manner by means of direct observations and carcass searches. A management programme must be compiled to assess the efficacy of applied mitigation measures and consult or change measures to reduce on-going mortalities when detected. Additional mitigation measures should be tested or applied, especially if mortalities include birds of prey and species of conservation concern.
- It is possible that bird mortalities due to collision will occur at **existing** power lines even after mitigation. The post-construction monitoring (during operation) should also quantify mortalities (especially vulture mortalities) caused by the existing power line network. The information could then be used to inform the electrical infrastructure mortality incident register. It is suggested that monitoring should be implemented once a month for at least one year when in operation. All searches should be done on foot. A management programme must be compiled to assess the efficacy of applied mitigation measures and consult or change measures to reduce on-going mortalities when detected. Additional mitigation measures should be tested or applied, especially if mortalities include birds of prey and species of conservation concern.

OBJECTIVE 1: <i>Minimise potential collision trauma with infrastructure and augmenting existing information on bird interactions with solar infrastructure</i>	
Project Component/s	» PV panel arrays
Potential Impact	» Collision trauma caused by photovoltaic panels (the "lake-effect")
Activity/Risk Source	» Operation of PV infrastructure
Mitigation: Target/Objective	» Zero bird mortalities due to collision trauma caused by PV panels

Mitigation: Action/Control	Responsibility	Timeframe
<ol style="list-style-type: none"> 1. 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. Nests should be removed when nest-building attempts are noticed. 2. Reduce or minimise the use of outdoor lighting to avoid attracting birds to the lights or to reduce potential disorientation to migrating birds. 3. Use indigenous plant species native to the study area during landscaping and rehabilitation. 4. Implement pre-construction monitoring protocols (as per Jenkins et al., 2017). 	ECO & OM	Operation (on-going)
<ol style="list-style-type: none"> 5. Implement post-construction monitoring and carcass surveys (as per Jenkins et al., 2017) 	ECO & OM	Operation (on-going)
<ol style="list-style-type: none"> 6. Compile management programme to assess efficacy of mitigation and on-going research/trials 	CER & ECO	Construction phase
	ECO & EM	Prior to construction - At least 1 survey of 2 days (during wet season)

	OM & CER	Post- construction - At least 2-3 surveys, each 3 days during a 6 month period
	EM & OM	Operation (on-going)

Performance Indicator	Reduced statistical detection/observation of bird mortalities
Monitoring	<ol style="list-style-type: none"> 1. Implement at least one pre-construction survey consisting of a minimum of 2 days. 2. Surveys should coincide with the peak wet season when most of the drainage lines and wetland features in the wider study region are inundated. 3. Obtain quantified data on waterbird/collision-prone bird richness and potential flyways, which will contribute towards the understanding of impacts related to collision trauma with the panels. 4. Monitor terrestrial birds at the fixed point counts by using the exact protocol applied during this report. 5. Implement post-construction survey during operation with a minimum of 2-3 x 3 day surveys during a six month period (including the peak wet season). 6. Obtain mortality data from birds colliding with the panels and advise on appropriate mitigation measures to be implemented to reduce potential bird mortalities. 7. Conduct post-construction monitoring in a systematic manner by means of direct observations (an option is the use of installed video cameras at selected areas) and carcass searches. 8. Implement management programme to assess the efficacy of applied mitigation measures and consult or change measures to reduce on-going mortalities when detected. Additional mitigation measures should be tested or applied, especially if mortalities include birds of prey and species of conservation concern.

OBJECTIVE 2: Minimise collisions and electrocution associated with <u>existing</u> power lines	
Project Component/s	» Existing overhead power lines
Potential Impact	» Collision and electrocution caused by existing power lines
Activity/Risk Source	» Overhead power lines
Mitigation: Target/Objective	» Reduced bird mortalities due to collision/electrocution

Mitigation: Action/Control	Responsibility	Timeframe
1. Apply bird deterrent devices to all existing power lines spanning the facility	ECO & CER	Construction
2. Implement post-construction monitoring and carcass surveys	OM	Operation - daily
3. Compile management programme to assess efficacy of mitigation and on-going research/trials	OM & CER	Operation - monthly for at least one year
4. Report mortalities (number, locality and species) to Electrical Energy Mortality Register at EWT	OM	Operation (on-going)

Mitigation: Action/Control	Responsibility	Timeframe

Performance Indicator	Reduced statistical detection/observation of bird mortalities
Monitoring	<ol style="list-style-type: none"> 1. Implement surveys for carcasses. 2. Implement post-construction monitoring to quantify bird mortalities caused by the power line network. All searches should be done on foot. 3. Compile a management programme to assess the efficacy of applied mitigation measures and consult or change measures to reduce on-going mortalities when detected. Additional mitigation measures should be tested or applied, especially if mortalities include birds of prey and species of conservation concern.

14.3 AGRICULTURAL

Prevention and management of soil erosion:

Project component/s	<ul style="list-style-type: none"> • Construction of infrastructure • Construction of the access road
Potential Impact	Soil particles can be removed from the area through wind and water erosion
Activity/risk source	The removal of vegetation in areas where infrastructure will be constructed.
Mitigation: Target/Objective	To avoid the onset of soil erosion that can spread into other areas

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> Limit vegetation clearance to only the areas where the surface infrastructure will be constructed. Avoid parking of vehicles and equipment outside of designated parking areas. Plan vegetation clearance activities for dry seasons (late autumn, winter and early spring). Design and implement a Stormwater Management System where run-off from surfaced areas is expected. Re-establish vegetation along the access road to reduce the impact of run-off from the road surface. 	Environmental Officer / SHEQ division	During the entire construction, operational and decommissioning phases

Performance Indicator	No visible signs of soil erosion around the project infrastructure
Monitoring	<ul style="list-style-type: none"> Regular inspections around the constructed infrastructure to detect early signs of soil erosion developing. When signs of erosion are detected the areas must be rehabilitated, using a combination of geo-textiles and re-vegetation to prevent the eroded area(s) from expanding.

Prevention and management of soil pollution:

Project component/s	<ul style="list-style-type: none"> Construction of infrastructure Daily activities and maintenance during the operational phase
Potential Impact	Potential fuel and oil spills from vehicles and waste generation can cause soil pollution.
Activity/risk source	<ul style="list-style-type: none"> Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation. Spills from vehicles transporting workers, equipment, and construction material to and from the construction site. The accidental spills from temporary chemical toilets used by construction workers. The generation of domestic waste by construction workers. Spills from fuel storage tanks during construction. Pollution from concrete mixing. Pollution from road-building materials.

	<ul style="list-style-type: none"> Any construction material remaining within the construction area once construction is completed. Containment breaches related to the battery units and any inadvertent chemical exposure therefrom.
Mitigation: Target/Objective	To avoid soil pollution that can harm the surrounding environment and human health.

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills. Any waste generated during construction must be stored in designated containers and removed from the site by the construction teams. Any left-over construction materials must be removed from site. Ensure battery transport and installation by accredited staff / contractors. Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation. 	Environmental Officer / SHEQ division	During the entire construction, operational and decommissioning phases

Performance Indicator	<ul style="list-style-type: none"> No visible signs of waste and spills within the project site. No accumulation of contaminants in the soils of the project site.
Monitoring	<ul style="list-style-type: none"> Regular inspections of vehicles and equipment that enter the project site. Analysis of soil samples around high-risk areas to determine whether soil contaminants are present. In the case that soil pollution is detected, immediate remediation must be done.

14.4 HERITAGE

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils, fossils of plants, insects, bone or coalified material) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 8). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. 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 SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered, then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished, then no further monitoring is required.

14.5 VISUAL

Construction Phase

- The laydown and building structures should be located away from neighbouring property farmsteads.
- Following the removal of the vegetation, wind blown dust during construction should be monitored by the ECO to ensure that it does not become a nuisance factor to the local receptors. Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under authorisation of the ECO.
- Topsoil from the footprints of the road and structures should be dealt with in accordance with EMP.
- The buildings should be painted a grey-brown colour.
- Fencing should be simple, diamond shaped (to catch wind-blown litter) and appear transparent from a distance. The fences should be checked on a monthly basis for the collection of litter caught on the fence.
- Signage on the main access roads should be moderated.
- Lights at night have the potential to significantly increase the visual exposure of the proposed project. It is recommended that mitigations be implemented to reduce light spillage (refer to appendix for general guidelines). No overhead lighting to be used for security purposes.
- Limit the height of the PV panels to maximum of 5.5m above ground level.
- To assist in reducing the colour contrast from the BESS system, medium sized trees need to be planted around the area to provide visual screening in the medium-term. The structures also need to be placed away from the R503 receptors.
- All internal power line cables need to be buried so as to reduce visual intrusion to the local landscape.

Operation Phase

- Control of lights at night to allow only local disturbance to the current dark sky night landscape (refer to appendix for general guidelines).
- Continued erosion control and management of dust.
- The buffer needs to be managed to ensure that the area does not become a fire risk.

Decommissioning Phase

- All structures should be removed and where possible, recycled.
- Building structures should be broken down (including foundations).
- The rubble should be managed according to NEMWA and deposited at a registered landfill if it cannot be recycled or reused.
- All compacted areas should be rehabilitated according to a rehabilitation specialist.
- Monitoring for soil erosion should be undertaken on a routine biannual basis for one year following the completion of the Decommissioning Phase.

14.6 TRAFFIC

- As far as practically possible, ensure staff transport is done in the 'Off Peak' period and by bus to reduce impact in the peak periods.
- Stagger material, component, and abnormal load deliveries.
- According to the South African Road Traffic Sign Manual (SARTSM), Adequate road signage on all external roads carrying development traffic.
- Reduction in the speed of vehicles.
- Adequate enforcement of the law.
- Implementation of pedestrian safety initiatives.
- Regular maintenance of farm fences & access cattle grids.
- Construction of gravel roads in terms of Technical Recommendations for Highways (TRH20).
- Implement a road maintenance program under the auspices of the respective transport department; and
- Possible use of approved dust suppressant techniques.
- A more comprehensive route analysis should be completed before construction to better understand the works required and the potential risks.
- No fatal flaws or preferences were identified for any proposed site alternatives, construction laydown areas, substation locations or Power line routes.

15. DECOMMISSIONING PHASE – IMPACT MANAGEMENT OUTCOMES AND ACTIONS

Should the activity ever cease or become redundant, the holder of the authorisation must undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements.

After the lifespan of the facility²⁵ (20-25 years), there is a possibility that the entire facility will be decommissioned and closed (although other options for continuation may be investigated)

Appendix 5 of Regulation 982 of the 2014 EIA Regulations contains the required contents of a Closure Plan. The table below shows the minimum requirements for a closure plan. The operating entity for this facility must ensure that the closure plan complies with these requirements as well as any other legislative requirements that may come into effect during the lifecycle of the project.

Requirement
(1) A closure plan must include -
(a) Details of - (i) The EAP who prepared the closure plan; and (ii) The expertise of that EAP.
(b) Closure objectives.
(c) Proposed mechanisms for monitoring compliance with and performance assessment against the closure plan and reporting thereon.
(d) Measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity and associated closure to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development including a handover report, where applicable.
(e) Information on any proposed avoidance, management and mitigation measures that will be taken to address the environmental impacts resulting from the undertaking of the closure activity.
(f) A description of the manner in which it intends to – (i) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation during closure; (ii) Remedy the cause of pollution or degradation and migration of pollutants during closure. (iii) Comply with any prescribed environmental management standards or practises; or (iv) Comply with any applicable provisions of the Act regarding closure.
(g) Time periods within which the measure contemplated in the closure plan must be implemented.
(h) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of closure.
(i) Details of all public participation processes conducted in terms of regulation 41 of the Regulation, including – (i) Copies of any representations and comments received from registered interested and affected parties; (ii) A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments;

• ²⁵ For the purposes of this section, the lifespan of the facility is deemed to be the period of the power purchase agreement.

Requirement
<ul style="list-style-type: none"> (iii) The minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants; (iv) Where applicable, an indication of the amendments made to the plan as a result of public participation processes conducted in terms of regulation 41 of these Regulations.
<ul style="list-style-type: none"> (j) Where applicable, details of any financial provisions for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.

Within a period of at least 12 months prior to the planned closure and decommissioning of the site, a Closure Plan must be prepared and submitted to the Local Planning Authority, as well as the Provincial and National Environmental Authorities and the Department of Forestry, Fisheries and the Environment (DFFE) for input and approval. This plan must provide detail pertaining to site restoration, soil replacement, landscaping, pro-active conservation, and a timeframe for implementation. Furthermore, the Closure Plan must comply with any additional legislation and guidelines that may be applicable at the time.

Two possible scenarios are considered for this decommissioning phase, as follows:

15.1 SCENARIO 1: TOTAL CLOSURE & DECOMMISSIONING OF SOLAR FACILITY

If the decision is taken at the end of the project lifespan (20 - 25 years) to totally decommission the solar facility i.e., make the land available for an alternative land use, a closure plan as detailed above should be developed and should include provision for the following:

- All concrete and solar infrastructure etc. must be removed from the solar site i.e., panels, support structures etc.;
- The holes where the panel support structures are removed must be levelled and covered with subsoil and topsoil;
- 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), topsoil replaced and brush-packed to encourage re-vegetation and minimise erosion;
- All auxiliary buildings and access points should be demolished, and rubble removed, unless they can be used for/by the future land use. The competent authority may prescribe that the landscaping and underground infrastructure i.e., foundations be left *in situ*;
- The underground electric cables must 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. Functional panels that still produce sufficient output could be repurposed upon decommissioning;
- The disturbed portions of the site must be brush-packed, replanted and/or seeded with locally sourced indigenous vegetation (as prescribed by the competent authorities) to allow re-vegetation and rehabilitation of the site (see plant species list attached);
- Discontinuation of Lease and Easement Agreements for main land and access roads;
- Consider whatever is economically or socially beneficial and risky for the project's Owners and other Stakeholders at this last stage
 - This could include selling equipment on secondary market, recycling of metals and modules as scrap, using some or all the proceeds to pay the local labour for uninstallation work, etc?
 - PV leaves no pollution and the equipment other than the modules which should be reused or recycled (There is an existing market for this).

15.2 SCENARIO 2: PARTIAL DECOMMISSIONING / UPGRADE OF SOLAR FACILITY

Due to low variable costs and loans repaid long ago, any owner of the facility may be interested in prolonging technical, functional, legal and economic lives of the plants for as long as possible, even beyond Power Purchase Agreement.

- This will require disposal of assets with shorter technical lives are critical (inverters, etc). PV modules, substructures, cables have a lifespan that should be longer than 25 years;
- Under this option, the O&M contractor will have to ensure that the validity period of all licences / permits and agreements is extended where necessary and that any legislation that has subsequently been promulgated is considered.

Should more advanced technology become available it may be decided to continue to use the site as a renewable energy / photovoltaic / solar facility. Should this be the case, it is likely that much of the existing infrastructure will be re-used in the upgraded facility.

All infrastructure that will no longer be required for the upgraded facility must be removed as described in Scenario 1 above. The remainder of the infrastructure should remain in place or upgraded depending on the requirements of the new facility. As described for Scenario 1 above, the function PV panels that are still capable of producing sufficient output, could be donated to local schools and clinics. Any upgrades to the facility at this stage must comply with relevant legislation and guidelines of the time.

16. MONITORING AND AUDITING

This section provided additional information of the monitoring and auditing requirements for the facility. It should be read in conjunction with the monitoring requirements outlined in the environmental impact management action tables as well the section on document control and reporting (which mainly deals with the internal monitoring requirements).

Environmental monitoring and audits are fundamental in ensuring the implementation of the management actions contained within this EMP are environmentally sustainable during development and operation of this PV Facility.

16.1 ENVIRONMENTAL MONITORING

16.1.1 Construction ECO and ESA Monitoring

The ECO, assisted by the ESA, is responsible for environmental monitoring during of the construction phase impact management actions as outlined in of this EMP. The monthly environmental control reports compiled by the ECO (which include the weekly environmental checklists compiled by the ESA), as well as the photographic record of works, must be submitted to the Holder of the EA, the EPC contractor, the local authority, the provincial environmental authority, the national environmental authority and Eskom.

The following overarching recording and reporting requirements are required²⁶:

- The holder of the authorisation must keep all records relating to monitoring and auditing on site and make it available for inspection to any relevant and competent authority in respect of this development.
- These compliance records must be submitted to the Director: Compliance monitoring at the DFFE.

16.1.2 Construction Phase Alien Vegetation Monitoring

• ²⁶ This must be read in conjunction with section 2 of the EMP

This section must be read in conjunction with the Alien Invasive Vegetation Management Plan once completed.

The following monitoring actions should be implemented during the construction phase of the development.

Table 4: Alien vegetation monitoring requirements during the construction phase.

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Preconstruction
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

16.1.3 Operational Phase Alien Vegetation Monitoring

This section must be read in conjunction with the Alien Invasive Vegetation Management Plan once completed.

The following monitoring actions should be implemented during the operational phase of the development.

Table 5: Alien vegetation monitoring requirements during the operational phase

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

16.1.4 Rehabilitation and Habitat Restoration Monitoring requirements

As rehabilitation success, particularly in arid areas is unpredictable, monitoring and follow-up actions are important to achieve the desired cover and soil protection.

- Re-vegetated areas should be monitored every 4 months for the first 12 months following construction.
- Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;
- Any areas showing erosion, should be re-contoured and seeded with indigenous grasses or other locally occurring species which grow quickly.

16.1.5 Plant Rescue Monitoring Requirements

It is important to monitor the success of the plant rescue operations, in order to the licencing authority on such conditional rescue.

Post construction monitoring of plants translocated during search and rescue must be undertaken to evaluate the success of the intervention. Biannual monitoring for 2 years post-transplant should be sufficient to gauge success.

The condition and numbers of all the rescued plants should be recorded and provided to the Audit consultant for inclusion in the environmental audit report.

16.2 ENVIRONMENTAL AUDITING²⁷

The holder of the environmental authorisation must, for the period during which the environmental authorisation is 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 at DFFE

This EMPr recommends that audits be submitted to the following auditing schedule:

- Within 6 months of commencement of construction activities;
- Within 30 days of completion of construction and rehabilitation activities;
- Every 3 years after the initial operational audit.

To promote transparency and cooperative governance, the results of relevant audits should be submitted to:

- The operators of the facility;
- The local authority;
- The provincial environmental authority;
- The national environmental authority: (DFFE); and
- Eskom.

The results of the audit must be recorded in an environmental audit report and any non-compliance must be formally recorded, along with the response-action required or undertaken. Each non-compliance incident report must be issued to the relevant person(s), so that the appropriate corrective and preventative action is taken within an agreed upon timeframe.

The table below shows the legislated requirements of an audit reports, and all relevant environmental audits undertaken as part of this development (during construction and operation) should comply with these requirements.

Table 6: Contents of an audit report

(1) An Environmental audit report prepared in terms of these Regulations must contain:
(a) Details of – (i) The independent person who prepared the environmental audit report; and (ii) The expertise of independent person that compiled the environmental audit report.
(b)Details of – (i) The independent person who prepared the environmental audit report; and (ii) The expertise of independent person that compiled the environmental audit report.
(c) A declaration that the independent auditor is independent in a form as may be specified by the competent authority.
(d) An indication of the scope of, and the purpose for which, the environmental audit report was prepared.
(e) A description of the methodology adopted in preparing the environmental audit report.
(f) An indication of the ability of the EMPr, and where applicable the closure plan to – (i) Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis; (ii) Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and (iii) Ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan.

- ²⁷ To ensure independence, the auditing defined in this section cannot be undertaken, by the Holder of the EA, the EPC contractor, nor the Environmental Control Officer. These should be undertaken by an external audit consultant.

(g) A description of any assumptions made, and any uncertainties or gaps in knowledge.
(h) A description of a consultation process that was undertaken during the course of carrying out the environmental audit report.
(i) A summary and copies of any comments that were received during any consultation process
(j) Any other information requested by the competent authority.

17. METHOD STATEMENTS

Method statements are written submissions by the Contractor to the Employers Representative and ECO in response to the requirements of this EMPr or in response to a request by the Employers Representative or ECO. The Contractor shall be required to prepare method statements for several specific construction activities and/or environmental management aspects.

The Contractor shall not commence the activity for which a method statement is required until the Employers Representative and ECO have approved the relevant method statement.

Method statements must be submitted at least five (5) working days prior to the proposed date of commencement of the specific activity. 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.

An approved method statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the contract. However, any damage caused to the environment through activities undertaken without an approved method statement shall be rehabilitated at the contractor's cost.

Additional method statements can be requested at the ECO's discretion at any time during the construction phase.

The method statements should include relevant details, such as:

- Construction procedures and location on the construction site;
- Start date and duration of the specific construction procedure;
- Materials, equipment and labour to be used;
- How materials, equipment and labour would be moved to and from the development site, as well as on site during construction;
- Storage, removal and subsequent handling of all materials, excess materials and waste materials;
- Emergency procedures in case of any potential accident / incident which could occur during the procedure;
- Compliance / non-compliance with an EMPr specification and motivation for proposed non-compliance.

17.1 METHOD STATEMENTS REQUIRED

Based on the specifications in this EMPr, the following method statements are likely to be required as a minimum (more method statements may be requested at any time as required under the direction of the ECO):

- Vegetation clearing & topsoil stripping, and associated stockpiling;
- Hazardous substances declaration of use, handling and storage – e.g., for fuels, chemicals, oils and any other harmful / toxic / hazardous materials;
- Cement and concrete batching;
- Traffic, transport & delivery accommodation e.g., need for traffic diversion/turning circles etc.;
- Solid waste management / control procedures;
- Stormwater and wastewater management / control systems;
- Erosion remediation and stabilisation;
- Fire control and emergency procedures;

- Job site security plan;
- Blasting activities (if necessary);
- Drilling and Ramming activities;
- Re-vegetation, rehabilitation and re-seeding.

18. HEALTH & SAFETY

The holder of the Authorisation must train safety representatives, managers and workers in workplace safety. The construction process must be compliant with all safety and health measures by the relevant act.

This section aims to provide a high-level overview to occupational Health and Safety Act but does not in any manner replace the project specific Health and Safety plan which would need to be compiled and approved in terms of this act and associated regulations.

The Occupational Health and Safety Act (No. 85 of 1993) aims to provide for / ensure the health and safety of persons at work or in connection with the activities of persons at work and to establish an advisory council for occupational health and safety.

The main Contractor must ensure compliance with the Occupational Health and Safety Act, as well as that all subcontractors comply with the Occupational Health and Safety Act.

The following is of key importance (Section 8 of the previously mentioned Act):

General duties of employers to their employees

(1) Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.

(2) Without derogating from the generality of an employer's duties under subsection (1), the matters to which those duties refer include in particular-

(a) the provision and maintenance of systems of work, plant and machinery that, as far as is reasonably practicable, are safe and without risks to health;

(b) taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety or health of employees, before resorting to personal protective equipment;

(c) making arrangements for ensuring, as far as is reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage or transport of articles or substances;

(d) establishing, as far as is reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as is reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons, and he shall provide the necessary means to apply such precautionary measures;

(e) providing such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of his employees;

(f) as far as is reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store or transport any article or substance or to operate any plant or machinery, unless the precautionary measures contemplated in paragraphs (b) and (d), or any other precautionary measures which may be prescribed, have been taken;

(g) taking all necessary measures to ensure that tire requirements of this Act are complied with by every person in his employment or on premises under his control where plant or machinery is used;

(h) enforcing such measures as may be necessary in the interest of health and safety;

(i) ensuring that work is performed, and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who have the authority to ensure that precautionary measures taken by the employer are implemented; and

(j) causing all employees to be informed regarding the scope of their authority as contemplated in section 37 (1) (b).

19. CONTRACTORS CODE OF CONDUCT

The Contractor's Code of Conduct is a document to be drawn up by the holder of the EA²⁸ and provided to all contractors or subcontractors that undertake any service on site. This code of conduct should include generic conduct rules for construction and operation activities on this Solar Energy Facility and must be signed by all contractors. **This code of conduct does not exonerate contractors from complying with this EMPr and must not be viewed as a stand-alone document.**

The following general template is suggested for this Code of Conduct document and must be adapted and updated to include the provisions of this EMPr, recommendations of participating specialists, conditions of approval of the Environmental Authorisation, conditions imposed by the Local Authority (as part of the rezoning and consent use), as well as all service agreements.

19.1 OBJECTIVES

To ensure compliance with the Conditions of the Environmental Authorisation, the Environmental Management Programme (EMPr), recommendations of participating specialists, conditions imposed by the Local Authority as part of the rezoning and subdivision, as well as the service agreements.

- To ensure the least possible damage to:
 - Existing infrastructure on and adjacent to the site;
 - Indigenous flora and fauna (biophysical environment); and
 - Water quality of surface and groundwater on and surrounding the site;
- Construction and development are undertaken with due consideration to all environmental factors;
- Where such damage occurs, provision is made for re-instatement and rehabilitation;

19.2 ACCEPTANCE OF REQUIREMENTS

To achieve these objectives, the Developer and EPC Contractor bind themselves jointly and severally to fulfil and comply with all the obligations contained herein, as well as prescriptions and obligations contained in other documents controlling the development of this Solar Energy Facility.

19.3 CONTRACTOR'S PRE-CONSTRUCTION OBLIGATIONS

Contractors may not commence any construction of this Solar Energy Facility until:

- The Contractor and the ECO have carried out a joint site inspection (this is to be done as part of the pre-construction compliance workshop as detailed in the EMPr above);
- A qualified ecologist has undertaken an inspection of the final development footprint and determined the number, species and extent of protected / listed plant species within this area;

• ²⁸ or delegated to the EPC contractor.

- A permit for the removal or relocation-and-transplant of any protected / listed plant species must be obtained, where necessary;
- Search and rescue of sensitive plants, within the development footprint has been carried out in compliance with the plant rescue and protection plan and signed off by the ECO (where this is necessary);
- The construction and no-go areas are suitably demarcated to the satisfaction of the ECO;
- Where necessary, approval of Building / Construction Plans has been obtained from the local authority; and
- All contract staff have attended the required environmental induction training and on-going environmental education sessions, as necessary.

19.4 CONTRACTOR'S OBLIGATIONS DURING CONSTRUCTION

- The Contractor is required to comply with the necessary Health and Safety requirements as required by the Occupational Health and Safety Act of 1993;
- The Contractor must comply with the construction requirements as detailed in the EMPr, including the following plans once they are completed prior to commencement of construction:
 - Transport & Traffic Management Plan,
 - Stormwater and Erosion-Control Management Plan,
 - Vegetation Clearing & Plant Rescue Plan (to be developed),
 - Re-vegetation & Rehabilitation Plan (to be developed),
 - Alien Management Plan (to be developed),
 - Open Space Management Plan (to be developed);
- The contractor must comply with all the requirements detailed in the Environmental Authorisation;
- All conditions, processes and fees as prescribed by the Local Authority must be complied with.

20. PENALTIES

Should any person commit an action of non-compliance he/she may be convicted of an offence, in terms of Sub-regulation (1) of the National Environmental Management Act, to imprisonment for a period not exceeding ten years or to a fine not exceeding R10 Million as prescribed in terms of the Adjustment of Fines Act, 1991 (Act No. 101 of 1991).

Apart from a fine resulting from any legal mechanism, the ECO may advise the Employers Representative to impose a penalty for non-compliance in terms of this Environmental Management Programme (EMPr). The procedure detailed below is for a spot fine in terms of this EMPr and does not detail the procedure for fining in terms of any other legal mechanism.

20.1 PROCEDURES

The contractor shall comply with the environmental specifications and requirements of this EMPr, the EA and Section 28 of NEMA, on an on-going basis and any failure on his part to do so will entitle the ER to impose a penalty.

In the event of non-compliance, the following recommended process shall be followed:

- The ECO shall issue a notice of non-compliance to the employer's representative, stating the nature and magnitude of the contravention. A copy shall be provided to the Project Developer / Proponent.
- The Employers Representative will issue this notice to the Contractor.
- The Contractor shall act to correct the transgression within the period specified by the Employers Representative.

- The Contractor shall provide the Employers Representative with a written statement describing the actions to be taken to discontinue the non-compliance, the actions taken to mitigate its effects and the expected results of the actions. A copy shall be provided to the Project Developer / Proponent.
- In the case of the Contractor failing to remedy the situation within the predetermined period, the Employers Representative shall impose a monetary penalty (spot fine) based on the conditions of contract.
- Should the transgression be a blatant disregard of conditions of the EMPr or EA, the Employers Representative (on advice from the ECO) can at their discretion immediately issue a fine and require the remediation (without first giving the contractor a chance to remediate).
- In the case of non-compliance giving rise to physical environmental damage or destruction, the Employers Representative shall be entitled to undertake or to cause to be undertaken such remedial works as may be required to make good such damage and to recover from the Contractor the full costs incurred in doing so.
- In the event of a dispute, difference of opinion, etc. between any parties in regard to or arising out of interpretation of the conditions of the EMPr, disagreement regarding the implementation or method of implementation of conditions of the EMPr or EA etc. any party shall be entitled to require that the issue be referred to specialists for determination.
- The Employers Representative on advice from the ECO shall always have the right to stop work and/or certain activities on site in the case of non-compliance or failure to implement remediation measures.

20.2 OFFENCES AND PENALTIES

Any avoidable non-compliance with the conditions of the EMPR shall be considered sufficient ground for the imposition of a monetary penalty by the Employers Representative.

Possible offences, which should result in the issuing of a contractual penalty, include, but are not limited to:

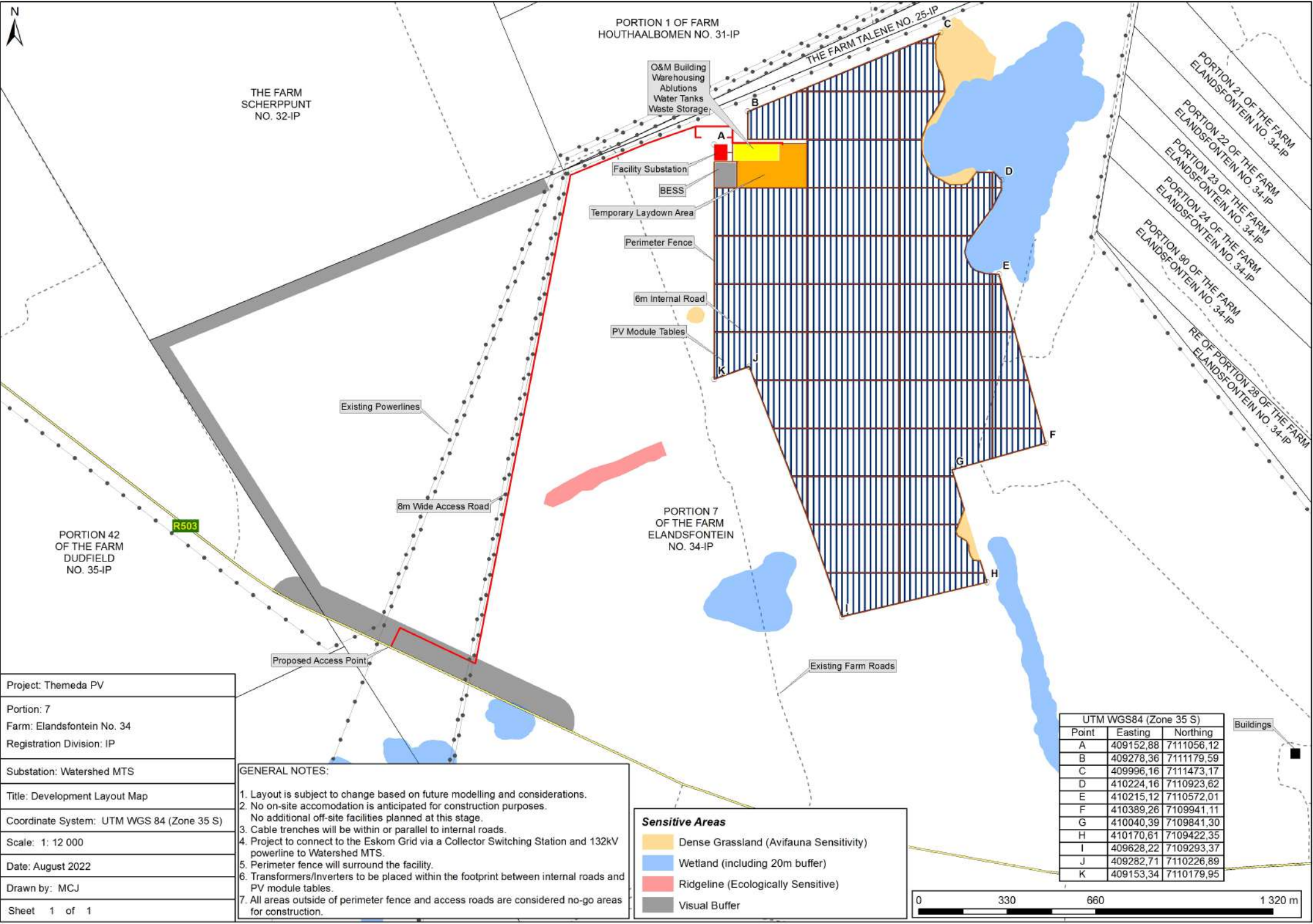
- Unauthorised entrance into no-go areas;
- Catching and killing of wild animals, and removal or damage to conservation-worthy plant species;
- Open fires outside of the contractor camp site and insufficient fire control;
- Unauthorised damage to natural vegetation;
- Unauthorised camp establishment (including stockpiling, storage, etc.);
- Hydrocarbons / hazardous material: negligent spills / leaks and insufficient storage;
- Ablution facilities: non-use, insufficient facilities, insufficient maintenance;
- Insufficient solid waste management (including clean-up of litter, unauthorised dumping etc.);
- Erosion due to negligence / non-performance;
- Excessive cement / concrete spillage / contamination;
- Non-induction of staff.

21. ABBREVIATIONS

AIA	Archaeological Impact Assessment
BGIS LUDS	Biodiversity Geographic Information System Land Use Decision Support
CBA	Critical Biodiversity Area
CDSM	Chief Directorate Surveys and Mapping
CEMPr	Construction Environmental Management Programme

DEFF	Department of Environment, Forestry and Fisheries
DEA&NC	Department of Environmental Affairs and Nature Conservation
DME	Department of Minerals and Energy
DSR	Draft Scoping Report
EAP	Environmental Impact Practitioner
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Ecological Support Area
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
kV	Kilo Volt
LUDS	Land Use Decision Support
LUPO	Land Use Planning Ordinance
MW	Mega Watt
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NPAES	National Protected Area Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act

PM	Post Meridiem; "Afternoon"
PSDF	Provincial Spatial Development Framework
S.A.	South Africa
SACAA / CAA	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
TOPS	Threatened and Protected Species



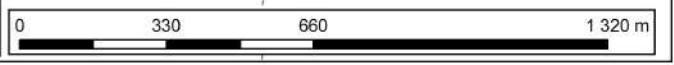
Project: Themeda PV
Portion: 7
Farm: Elandsfontein No. 34
Registration Division: IP
Substation: Watershed MTS
Title: Development Layout Map
Coordinate System: UTM WGS 84 (Zone 35 S)
Scale: 1: 12 000
Date: August 2022
Drawn by: MCJ
Sheet 1 of 1

- GENERAL NOTES:**
1. Layout is subject to change based on future modelling and considerations.
 2. No on-site accommodation is anticipated for construction purposes.
No additional off-site facilities planned at this stage.
 3. Cable trenches will be within or parallel to internal roads.
 4. Project to connect to the Eskom Grid via a Collector Switching Station and 132kV powerline to Watershed MTS.
 5. Perimeter fence will surround the facility.
 6. Transformers/Inverters to be placed within the footprint between internal roads and PV module tables.
 7. All areas outside of perimeter fence and access roads are considered no-go areas for construction.

Sensitive Areas

- Dense Grassland (Avifauna Sensitivity)
- Wetland (including 20m buffer)
- Ridgeline (Ecologically Sensitive)
- Visual Buffer

UTM WGS84 (Zone 35 S)		
Point	Easting	Northing
A	409152,88	7111056,12
B	409278,36	7111179,59
C	409996,16	7111473,17
D	410224,16	7110923,62
E	410215,12	7110572,01
F	410389,26	7109941,11
G	410040,39	7109841,30
H	410170,61	7109422,35
I	409628,22	7109293,37
J	409282,71	7110226,89
K	409153,34	7110179,95



GENERIC ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE DEVELOPMENT AND EXPANSION OF SUBSTATION INFRASTRUCTURE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICITY





environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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INTRODUCTION

1. Background

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) requires that an environmental management programme (EMPr) be submitted where an environmental impact assessment (EIA) has been identified as the environmental instrument to be utilised as the basis for a decision on an application for environmental authorisation (EA). The content of an EMPr must either contain the information set out in Appendix 4 of the Environmental Impact Assessment Regulations, 2014, as amended (EIA Regulations) or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a government notice. Once the Minister has identified, through a government notice that a generic EMPr is relevant to an application for EA, that generic EMPr must be applied by all parties involved in the EA process, including but not limited to the applicant and the competent authority (CA).

2. Purpose

This document constitutes a generic EMPr relevant to applications for the development or expansion of substation infrastructure for the transmission and distribution of electricity, and all listed and specified activities necessary for the realisation of such infrastructure.

3. Objective

The objective of this generic EMPr is to prescribe and pre-approve generally accepted impact management outcomes and impact management actions, which can commonly and repeatedly be used for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of substation infrastructure for the transmission and distribution of electricity. The use of a generic EMPr is intended to reduce the need to prepare and review individual EMPrs for applications of a similar nature.

4. Scope

The scope of this generic EMPr applies to the development or expansion of substation infrastructure for the transmission and distribution of electricity requiring EA in terms of NEMA. This generic EMPr applies to activities requiring EA, mainly activity 11 and 47 of the Environmental Impact Assessment Regulations Listing Notice 1 of 2014, as amended, and activity 9 of the Environmental Impact Assessment Regulations Listing Notice 2 of 2014, as amended, and all associated listed or specified activities necessary for the realization of such infrastructure.

5. Structure of this document

This document is structured in three parts with an Appendix as indicated in the table below:

Part	Section	Heading	Content
A		Provides general guidance and information and is not legally binding	Definitions, acronyms, roles & responsibilities and documentation and reporting.
B	1	Pre-approved generic EMPr template	<p>Contains generally accepted impact management outcomes and impact management actions required for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of substation infrastructure for the transmission and distribution of electricity, which are presented in the form of a template that has been pre-approved.</p> <p>The template in this section is to be completed by the contractor, with each completed page signed and dated by the holder of the EA prior to commencement of the activity.</p> <p>Where an impact management outcome is not relevant, the words "not applicable" can be inserted in the template under the "responsible persons" column.</p> <p>Once completed and signed, the template represents the EMPr for the activity approved by the CA and is legally binding. The template is not required to be submitted to the CA as once the generic EMPr is gazetted for implementation, it has been approved by the CA.</p> <p>To allow interested and affected parties access to the pre-approved EMPr template for consideration through the decision-making process, the EAP on behalf of the applicant /proponent must make the hard copy of this EMPr available at a public location and where the applicant has a website, the EMPr should also be made available on such publicly accessible website.</p>
	2	Site specific information	Contains preliminary infrastructure layout and a declaration that the applicant/holder of the EA

Part	Section	Heading	Content
			<p>will comply with the pre-approved generic EMPr template contained in <u>Part B: Section 1</u>, and understands that the impact management outcomes and impact management actions are legally binding. The preliminary infrastructure layout must be finalized to inform the final EMPr that is to be submitted with the basic assessment report (BAR) or environmental impact assessment report (EIAR), ensuring that all impact management outcomes and impact management actions have been either pre-approved or approved in terms of <u>Part C</u>.</p> <p>This section must be submitted to the CA together with the final BAR or EIAR. The information submitted to the CA will be considered to be incomplete should a signed copy of <u>Part B: section 2</u> not be submitted. Once approved, this Section forms part of the EMPr for the development and is legally binding.</p>
C		Site specific sensitivities/ attributes	<p>If any specific environmental sensitivities/ attributes are present on the site which require site specific impact management outcomes and impact management actions, not included in the pre-approved generic EMPr, to manage impacts, these specific impact management outcomes and impact management actions must be included in this section. These specific environmental attributes must be referenced spatially and impact management outcomes and impact management actions must be provided. These specific impact management outcomes and impact management actions must be presented in the format of the pre-approved EMPr template (<u>Part B: section 1</u>)</p> <p>This section will not be required should the site contain no specific environmental sensitivities or attributes. However, if <u>Part C</u> is applicable to the site, it is required to be submitted together with the BAR or EIAR, for consideration of, and decision on, the application for EA. The</p>

Part	Section	Heading	Content
			<p>information in this section must be prepared by an EAP and must contain his/her name and expertise including a curriculum vitae. Once approved, Part C forms part of the EMPr for the site and is legally binding.</p> <p>This section applies only to additional impact management outcomes and impact management actions that are necessary for the avoidance, management and mitigation of impacts and risks associated with the specific development or expansion and which are not already included in <u>Part B: section 1</u>.</p>
		Appendix 1	Contains the method statements to be prepared prior to commencement of the activity. The method statements are not required to be submitted to the competent authority.

6. Completion of part B: section 1: the pre-approved generic EMPr template

The template is to be completed prior to commencement of the activity, by providing the following information for each environmental impact management action:

- For implementation
 - a 'responsible person',
 - a method for implementation,
 - a timeframe for implementation
- For monitoring
 - a responsible person
 - frequency
 - evidence of compliance.

The completed template must be signed and dated by the holder of the EA prior to commencement of the activity. The method statements prepared and agreed to by the holder of the EA must be appended to the template as Appendix 1. Each method statement must be signed and dated on each page by the holder of the EA. This template once signed and dated is legally binding. The holder of the EA will remain responsible for its implementation.

7. Amendments of the impact management outcomes and impact management actions

Once the activity has commenced, a holder of an EA may make amendments to the impact management outcomes and impact management actions in the following manner:

- Amendment of the impact management outcomes: in line with the process contemplated in Regulation 37 of the EIA Regulations; and
- Amendment of the impact management actions: in line with the process contemplated in Regulation 36 of the EIA Regulations.

8. Documents to be submitted as part of part B: section 2 site specific information and declaration

Part B: Section 2 has three distinct sub-sections. The first and third sub-sections are in a template format. Sub-section two requires a map to be produced.

Sub-section 1 contains the project name, the applicant's name and contact details, the site information, which includes coordinates of the property or farm in which the proposed substation infrastructure is proposed as well as the 21-digit Surveyor General code of each cadastral land parcel and, where available, the farm name.

Sub-section 2 is to be prepared by an EAP and must contain his/her name and expertise including a curriculum vitae. This sub-section must include a map of the site sensitivity overlaid with the preliminary infrastructure layout using the national web based environmental screening tool, when available for compulsory use at: <https://screening.environment.gov.za/screeningtool>. The sensitivity map shall identify the nature of each sensitive feature e.g. threatened plant species, archaeological site, etc. Sensitivity maps shall identify features both within the planned working area and any known sensitive features and within 50 m from the development footprint.

Sub-section 3 is the declaration that the applicant (s)/proponent (s) or holder of the EA in the case of a change of ownership must complete which confirms that the applicant/EA holder will comply with the pre-approved 'generic EMPr' template in Section 1 and understands that the impact management outcomes and impact management actions are legally binding.

(a) Amendments to Part B: Section 2 – site specific information and declaration

Should the EA be transferred, Part B: Section 2 must be completed by the new applicant/proponent and submitted with the application for an amendment of the EA in terms of regulations 29 or 31 of the EIA Regulations, whichever applies. The information submitted as part of such an application for an amendment to an EA will be considered to be incomplete should a signed copy of Part B: Section 2 not be submitted. Once approved, Part B: Section 2 forms part of the EMPr for the development and the EMPr becomes legally binding to the new EA holder.

PART A – GENERAL INFORMATION

1. DEFINITIONS

In this EMPr any word or expression to which a meaning has been assigned in the NEMA or EIA Regulations has that meaning, and unless the context requires otherwise –

"clearing" means the clearing and removal of vegetation, whether partially or in whole, including trees and shrubs, as specified;

"construction camp" is the area designated for key construction infrastructure and services, including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management;

"contractor" - The Contractor has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract, are in line with the Environmental Management Programme and that Method Statements are implemented as described.

"hazardous substance" is a substance governed by the Hazardous Substances Act, 1973 (Act No. 15 of 1973) as well as the Hazardous Chemical and Substances Regulations, 1995;

"method statement" means a written submission by the Contractor to the Project Manager in response to this EMPr or a request by the Project Manager and ECO. The method statement must set out the equipment, materials, labour and method(s) the Contractor proposes using to carry out an activity identified by the Project Manager when requesting the Method Statement. This must be done in such detail that the Project Manager and ECO is able to assess whether the Contractor's proposal is in accordance with this specification and/or will produce results in accordance with this specification;

The method statement must cover as a minimum applicable details with regard to:

- (i) Construction procedures;
- (ii) Plant, materials and equipment to be used;
- (iii) Transporting the equipment to and from site;
- (iv) How the plant/ material/ equipment will be moved while on site;
- (v) How and where the plant/ material/ equipment will be stored;
- (vi) The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- (vii) Timing and location of activities;
- (viii) Compliance/ non-compliance; and
- (ix) Any other information deemed necessary by the Project Manager.

“slope” means the inclination of a surface expressed as one unit of rise or fall for so many horizontal units;

“solid waste” means all solid waste, including construction debris, hazardous waste, excess cement/ concrete, wrapping materials, timber, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers);

“spoil” means excavated material which is unsuitable for use as material in the construction works or is material which is surplus to the requirements of the construction works;

“topsoil” means a varying depth (up to 300 mm) of the soil profile irrespective of the fertility, appearance, structure, agricultural potential, fertility and composition of the soil;

“works” means the works to be executed in terms of the Contract

2. ACRONYMS and ABBREVIATIONS

CA	Competent Authority
cEO	Contractors Environmental Officer
dEO	Developer Environmental Officer
DPM	Developer Project Manager
DSS	Developer Site Supervisor
EAR	Environmental Audit Report
ECA	Environmental Conservation Act No. 73 of 1989
ECO	Environmental Control Officer
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
ERAP	Emergency Response Action Plan
EMPr	Environmental Management Programme Report
EAP	Environmental Assessment Practitioner
FPA	Fire Protection Agency
HCS	Hazardous chemical Substance
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act ,2004 (Act No. 10 of 2004)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
MSDS	Material Safety Data Sheet
RI&AP's	Registered Interested and affected parties

3. ROLES AND RESPONSIBILITIES FOR ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) IMPLEMENTATION

The effective implementation of this generic EMPr is dependent on established and clear roles, responsibilities and reporting lines within an institutional framework. This section of the EMPr gives guidance to the various environmental roles and reporting lines, however, project specific requirements will ultimately determine the need for the appointment of specific person(s) to undertake specific roles and or responsibilities. As such, it must be noted that in the event that no specific person, for example, an environmental control officer (ECO) is appointed, the holder of the EA remains responsible for ensuring that the duties indicated in this document for action by the ECO are undertaken.

Table 1: Guide to roles and responsibilities for implementation of an EMPr

Responsible Person(s)	Role and Responsibilities
Developer's Project Manager (DPM)	<p><u>Role</u></p> <p>The Project Developer is accountable for ensuring compliance with the EMPr and any conditions of approval from the competent authority (CA). Where required, an environmental control officer (ECO) must be contracted by the Project Developer to objectively monitor the implementation of the EMPr according to relevant environmental legislation, and the conditions of the environmental authorisation (EA). The Project Developer is further responsible for providing and giving mandate to enable the ECO to perform responsibilities, and he must ensure that the ECO is integrated as part of the project team while remaining independent.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - Be fully conversant with the conditions of the EA; - Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s); - Issuing of site instructions to the Contractor for corrective actions required; - Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; and - Ensure that periodic environmental performance audits are undertaken on the project implementation.

Responsible Person(s)	Role and Responsibilities
Developer Site Supervisor (DSS)	<p><u>Role</u> The DSS reports directly to the DPM, oversees site works, liaises with the contractor(s) and the ECO. The DSS is responsible for the day to day implementation of the EMPr and for ensuring the compliance of all contractors with the conditions and requirements stipulated in the EMPr.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - Ensure that all contractors identify a contractor's Environmental Officer (cEO); - Must be fully conversant with the conditions of the EA. Oversees site works, liaison with Contractor, DPM and ECO; - Must ensure that all landowners have the relevant contact details of the site staff, ECO and cEO; - Issuing of site instructions to the Contractor for corrective actions required; - Will issue all non-compliances to contractors; and - Ratify the Monthly Environmental Report.
Environmental Control Officer (ECO)	<p><u>Role</u> The ECO should have appropriate training and experience in the implementation of environmental management specifications. The primary role of the ECO is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ECO is also required to conduct compliance audits, verifying the monitoring reports submitted by the cEO. The ECO provides feedback to the DSS and Project Manager regarding all environmental matters. The Contractor, cEO and dEO are answerable to the Environmental Control Officer for non-compliance with the Performance Specifications as set out in the EA and EMPr.</p> <p>The ECO provides feedback to the DSS and Project Manager, who in turn reports back to the Contractor and potential and Registered Interested & Affected Parties' (RI&AP's), as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager, and resolved with the Contractor as per the conditions of his contract. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a</p>

Responsible Person(s)	Role and Responsibilities
	<p>variation, not allowed for in the Performance Specification) must be endorsed by the Project Manager. The ECO must also, as specified by the EA, report to the relevant CA as and when required.</p> <p><u>Responsibilities</u></p> <p>The responsibilities of the ECO will include the following:</p> <ul style="list-style-type: none"> - Be aware of the findings and conclusions of all EA related to the development; - Be familiar with the recommendations and mitigation measures of this EMPr; - Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; - Undertake regular and comprehensive site inspections / audits of the construction site according to the generic EMPr and applicable licenses in order to monitor compliance as required; - Educate the construction team about the management measures contained in the EMPr and environmental licenses; - Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective; - Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements; - In consultation with the Developer Site Supervisor order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses; - Liaison between the DPM, Contractors, authorities and other lead stakeholders on all environmental concerns; - Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr; - Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO); - Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken; - Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken;

Responsible Person(s)	Role and Responsibilities
	<ul style="list-style-type: none"> - Assisting in the resolution of conflicts; - Facilitate training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the Contractor; - In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non-compliance; - Maintenance, update and review of the EMPr; - Communication of all modifications to the EMPr to the relevant stakeholders.
<p>developer Environmental Officer (dEO)</p>	<p><u>Role</u></p> <p>The dEOs will report to the Project Manager and are responsible for implementation of the EMPr, environmental monitoring and reporting, providing environmental input to the Project Manager and Contractor’s Manager, liaising with contractors and the landowners as well as a range of environmental coordination responsibilities.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - Be fully conversant with the EMPr; - Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures; - Ensure that all stipulations within the EMPr are communicated and adhered to by the Employees, Contractor(s) ; - Confine the development site to the demarcated area; - Conduct environmental internal audits with regards to EMPr and authorisation compliance (on cEO); - Assist the contractors in addressing environmental challenges on site; - Assist in incident management: - Reporting environmental incidents to developer and ensuring that corrective action is taken, and lessons learnt shared; - Assist the contractor in investigating environmental incidents and compile investigation reports; - Follow-up on pre-warnings, defects, non-conformance reports;

Responsible Person(s)	Role and Responsibilities
	<ul style="list-style-type: none"> - Measure and communicate environmental performance to the Contractor; - Conduct environmental awareness training on site together with ECO and cEO; - Ensure that the necessary legal permits and / or licenses are in place and up to date; - Acting as Developer's Environmental Representative on site and work together with the ECO and contractor;
Contractor	<p><u>Role</u></p> <p>The Contractor appoints the cEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. External contractors must ensure compliance with this EMPr while performing the onsite activities as per their contract with the Project Developer. The contractors are required, where specified, to provide Method Statements setting out in detail how the impact management actions contained in the EMPr will be implemented during the development or expansion of substation infrastructure for the transmission and distribution of electricity activities.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - project delivery and quality control for the development services as per appointment; - employ a suitably qualified person to monitor and report to the Project Developer's appointed person on the daily activities on-site during the construction period; - ensure that safe, environmentally acceptable working methods and practices are implemented and that equipment is properly operated and maintained, to facilitate proper access and enable any operation to be carried out safely; - attend on site meeting(s) prior to the commencement of activities to confirm the procedure and designated activity zones; - ensure that contractors' staff repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in EMPr, to the satisfaction of the ECO.

Responsible Person(s)	Role and Responsibilities
contractor Environmental Officer (cEO)	<p><u>Role</u></p> <p>Each Contractor affected by the EMPr should appoint a cEO, who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. As a minimum the cEO shall meet the following criteria:</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> - Be on site throughout the duration of the project and be dedicated to the project; - Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site; - Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements; - Attend the Environmental Site Meeting; - Undertaking corrective actions where non-compliances are registered within the stipulated timeframes; - Report back formally on the completion of corrective actions; - Assist the ECO in maintaining all the site documentation; - Prepare the site inspection reports and corrective action reports for submission to the ECO; - Assist the ECO with the preparing of the monthly report; and - Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company.

4. ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE

To ensure accountable and demonstrated implementation of the EMPr, a number of reporting systems, documentation controls and compliance mechanisms must be in place for all substation infrastructure projects as a minimum requirement.

4.1 Document control/Filing system

The holder of the EA is solely responsible for the upkeep and management of the EMPr file. As a minimum, all documentation detailed below will be stored in the EMPr file. A hard copy of all documentation shall be filed, while an electronic copy may be kept where relevant. A duplicate file will be maintained in the office of the DSS (where applicable). This duplicate file must remain current and up-to-date. The filing system must be updated and relevant documents added as required. The EMPr file must be made available at all times on request by the CA or other relevant authorities. The EMPr file will form part of any environmental audits undertaken as prescribed in the EIA Regulations.

4.2 Documentation to be available

At the outset of the project the following preliminary list of documents shall be placed in the filing system and be accessible at all times:

- Full copy of the signed EA from the CA in terms of NEMA, granting approval for the development or expansion;
- Copy of the generic and site specific EMPr as well as any amendments thereof;
- Copy of declaration of implementing generic EMPr and subsequent approval of site specific EMPr and amendments thereof;
- All method statements;
- Completed environmental checklists;
- Minutes and attendance register of environmental site meetings;
- An up-to-date environmental incident log;
- A copy of all instructions or directives issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record;
- Complaints register.

4.3 Weekly Environmental Checklist

The ECOs are required to complete a Weekly Environmental Checklist, the format of which is to be agreed prior to commencement of the activity. The ECOs are required to sign and date the checklist, retain a copy in the EMPr file and submit a copy of the completed checklist to the DSS on a weekly basis.

The checklists will form the basis for the Monthly Environmental Reports. Copies of all completed checklists will be attached as Annexures to the Environmental Audit Report as required in terms of the EIA Regulations.

4.4 Environmental site meetings

Minutes of the environmental site meetings shall be kept. The minutes must include an attendance register and will be attached to the Monthly Report that is distributed to attendees. Each set of minutes must clearly record "Matters for Attention" that will be reviewed at the next meeting.

4.5 Required Method Statements

The method statement will be done in such detail that the ECOs are enabled to assess whether the contractor's proposal is in accordance with the EMPr.

The method statement must cover applicable details with regard to:

- development 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 EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the Project Manager, the Contractor shall provide the following method statements to the Project Manager no less than 14 days prior to the commencement date of the activity:

- Site establishment – Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Batch plants;
- Workshop or plant servicing;
- Handling, transport and storage of Hazardous Chemical Substance's;
- Vegetation management – Protected, clearing, aliens, felling;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);
- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise management methodologies;
- Fauna interaction and risk management – only if the risk was identified – wildlife interaction especially on game farms; and
- Heritage and palaeontology management.

The ECOs shall monitor and ensure that the contractors perform in accordance with these method statements. Completed and agreed method statements between the holder of the EA and the contractor shall be captured in Appendix 1.

4.6 Environmental Incident Log (Diary)

The ECOs are required to maintain an up-to-date and current Environmental Incident Log (environmental diary). The Environmental Incident Log is a means to record all environmental incidents and/or all non-compliance notice would not be issued. An environmental incident is defined as:

- Any deviation from the listed impact management actions (listed in this EMPr) that may be addressed immediately by the ECOs. (For example a contractor's staff member littering or a drip tray that has not been emptied);
- Any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions for an afternoon); and
- General environmental information such as road kills or injured wildlife.

The ECOs are to record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the Developer. The Log is to be kept in the EMPr file and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor responsible;
- The incident must be listed as significant or minor;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

The Environmental Incident Log will be captured in the EAR.

4.7 Non-compliance

A non-compliance notice will be issued to the responsible contractor by the ECOs via the DSS or Project Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.
- The contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice.

Complaints received regarding activities on the development site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant CA for them to deal with the transgression, as it deems fit. The contractor is deemed not to have complied with the EMPr if, inter alia, There is a deviation from the environmental conditions, impact management outcomes and impact management actions activities, as approved in generic and site specific EMPr as relevant as set out in the EMPr, which deviation has, or may cause, an environmental impact.

4.8 Corrective action records

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the DSS, the contractor's cEO will ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the cEO is to issue a Corrective Action Report in writing to the ECOs. If satisfied that the corrective action has been completed, the ECOs are to sign-off on the Corrective Action Report, and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report has signed off by the ECOs.

4.9 Photographic record

A digital photographic record will be kept. The photographic record will be used to show before, during and post rehabilitation evidence of the project as well used in cases of damages claims if they arise. Each image must be dated and a brief description note attached.

The Contractor shall:

1. Allow the ECOs access to take photographs of all areas, activities and actions.

The ECOs shall keep an electronic database of photographic records which will include:

1. Pictures of all areas designated as work areas, camp areas, development sites and storage areas taken before these areas are set up;
2. All bunding and fencing;
3. Road conditions and road verges;
4. Condition of all farm fences;
5. Topsoil storage areas;
6. All areas to be cordoned off during construction;
7. Waste management sites;
8. Ablution facilities (inside and out);
9. Any non-conformances deemed to be "significant";
10. All completed corrective actions for non-compliances;
11. All required signage;
12. Photographic recordings of incidents;
13. All areas before, during and post rehabilitation; and

14. Include relevant photographs in the Final Environmental Audit Report.

4.10 Complaints register

The ECOs shall keep a current and up-to-date complaints register. The complaints register is to be a record of all complaints received from communities, stakeholders and individuals. The Complaints Record shall:

1. Record the name and contact details of the complainant;
2. Record the time and date of the complaint;
3. Contain a detailed description of the complaint;
4. Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECOs to take relevant photographs); and
5. Contain a copy of the ECOs written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECOs shall respond as described in **(section 4.11)** below.

4.11 Claims for damages

In the event that a Claim for Damages is submitted by a community, landowner or individual, the ECOs shall:

1. Record the full detail of the complaint as described in **(section 4.10)** above;
2. The DPM will evaluate the claim and associated damage and submit the evaluation to the Senior Site Representative for approval;
3. Following consideration by the DPM, the claim is to be resolved and settled immediately, or the reason for not accepting the claim communicated in writing to the claimant. Should the claimant not accept this, the ECO shall, in writing report the incident to the Developer's negotiator and legal department; and
4. A formal record of the response by the ECOs to the claimant as well as the rectification of the method of making payments not amount will be recorded in the EMPr file.

4.12 Interactions with affected parties

Open, transparent and good relations with affected landowners, communities and regional staff are an essential aspect to the successful management and mitigation of environmental impacts.

The ECOs shall:

1. Ensure that all queries, complaints and claims are dealt within an agreed timeframe;
2. Ensure that any or all agreements are documented, signed by all parties and a record of the agreement kept in the EMPr file;
3. Ensure that a complaints telephone numbers are made available to all landowners and affected parties; and

4. Ensure that contact with affected parties is courteous at all times;

4.13 Environmental audits

Internal environmental audits of the activity and implementation of the EMPr must be undertaken. The findings and outcomes included in the EMPr file and submitted to the CA at intervals as indicated in the EA.

The ECOs must prepare a monthly EAR. The report will be tabled as the key point on the agenda of the Environmental Site Meeting. The Report is submitted for acceptance at the meeting and the final report will be circulated to the Project Manager and filed in the EMPr file. At a frequency determined by the EA, the ECOs shall submit the monthly reports to the CA. At a minimum the monthly report is to cover the following:

- Weekly Environmental Checklists;
- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- Environmental Monitoring;
- General environmental findings and actions; and
- Minutes of the Bi-monthly Environmental Site Meetings.

4.14 Final environmental audits

On final completion of the rehabilitation and/or requirements of the EA a final EAR is to be prepared and submitted to the CA. The EAR must comply with Appendix 7 of the EIA Regulations.

PART B: SECTION 1: Pre-approved generic EMPr template

5. IMPACT MANAGEMENT OUTCOMES AND IMPACT MANAGEMENT ACTIONS

This section provides a pre-approved generic EMPr template with aspects that are common to the development of substation infrastructure for the transmission and distribution of electricity. There is a list of aspects identified for the development or expansion of substation infrastructure for the transmission and distribution of electricity, and for each aspect a set of prescribed impact management outcomes and associated impact management actions have been identified. Holders of EAs are responsible to ensure the implementation of these outcomes and actions for all projects as a minimum requirement, in order to mitigate the impact of such aspects identified for the development or expansion of substation infrastructure for the transmission and distribution of electricity.

The template provided below is to be completed by providing the information under each heading for each environmental impact management action.

The completed template must be signed and dated on each page by both the contractor and the holder of the EA prior to commencement of the activity. The method statements prepared and agreed to by the holder of the EA must be appended to the template as Appendix 1. Each method statement must also be duly signed and dated on each page by the contractor and the holder of the EA. This template, once signed and dated, is legally binding. The holder of the EA will remain responsible for its implementation.

5.1 Environmental awareness training

Impact management outcome: All onsite staff are aware and understands the individual responsibilities in terms of this EMPr.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All staff must receive environmental awareness training prior to commencement of the activities; - The Contractor must allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course; - Refresher environmental awareness training is available as and when required; - All staff are aware of the conditions and controls linked to the EA and within the EMPr and made aware of their individual roles and responsibilities in achieving compliance with the EA and EMPr; - The Contractor must erect and maintain information posters at key locations on site, and the posters must include the following information as a minimum: <ul style="list-style-type: none"> a) Safety notifications; and b) No littering. - Environmental awareness training must include as a minimum the following: <ul style="list-style-type: none"> a) Description of significant environmental impacts, actual or potential, related to their work activities; b) Mitigation measures to be implemented when carrying out specific activities; 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<ul style="list-style-type: none"> c) Emergency preparedness and response procedures; d) Emergency procedures; e) Procedures to be followed when working near or within sensitive areas; f) Wastewater management procedures; g) Water usage and conservation; h) Solid waste management procedures; i) Sanitation procedures; j) Fire prevention; and k) Disease prevention. <ul style="list-style-type: none"> - A record of all environmental awareness training courses undertaken as part of the EMPr must be available; - Educate workers on the dangers of open and/or unattended fires; - A staff attendance register of all staff to have received environmental awareness training must be available. - Course material must be available and presented in appropriate languages that all staff can understand. 						
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5.2 Site Establishment development

Impact management outcome: Impacts on the environment are minimised during site establishment and the development footprint are kept to demarcated

development area.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - A method statement must be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management; - Location of camps must be within approved area to ensure that the site does not impact on sensitive areas identified in the environmental assessment or site walk through; - Sites must be located where possible on previously disturbed areas; - The camp must be fenced in accordance with Section 5.5: Fencing and gate installation; and - The use of existing accommodation for contractor staff, where possible, is encouraged. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.3 Access restricted areas

Impact management outcome: Access to restricted areas prevented.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> – Identification of access restricted areas is to be informed by the environmental assessment, site walk through and any additional areas identified during development; – Erect, demarcate and maintain a temporary barrier with clear signage around the perimeter of any access restricted area, colour coding could be used if appropriate; and – Unauthorised access and development related activity inside access restricted areas is prohibited. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.4 Access roads

Impact management outcome: Minimise impact to the environment through the planned and restricted movement of vehicles on site.						
Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> – An access agreement must be formalised and signed by the DPM, Contractor and landowner before commencing with the activities; – All private roads used for access to the servitude must be maintained and upon completion of the works, be left in at least the original condition – All contractors must be made aware of all these access routes. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<ul style="list-style-type: none"> - Any access route deviation from that in the written agreement must be closed and re-vegetated immediately, at the contractor's expense; - Maximum use of both existing servitudes and existing roads must be made to minimize further disturbance through the development of new roads; - In circumstances where private roads must be used, the condition of the said roads must be recorded in accordance with section 4.9: photographic record; prior to use and the condition thereof agreed by the landowner, the DPM, and the contractor; - Access roads in flattish areas must follow fence lines and tree belts to avoid fragmentation of vegetated areas or croplands - Access roads must only be developed on a pre-planned and approved roads. 						
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5.5 Fencing and Gate installation

<p>Impact management outcome: Minimise impact to the environment and ensure safe and controlled access to the site through the erection of fencing and gates where required.</p>		
<p>Impact Management Actions</p>	<p>Implementation</p>	<p>Monitoring</p>

	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Use existing gates provided to gain access to all parts of the area authorised for development, where possible; - Existing and new gates to be recorded and documented in accordance with section 4.9: photographic record; - All gates must be fitted with locks and be kept locked at all times during the development phase, unless otherwise agreed with the landowner; - At points where the line crosses a fence in which there is no suitable gate within the extent of the line servitude, on the instruction of the DPM, a gate must be installed at the approval of the landowner; - Care must be taken that the gates must be so erected that there is a gap of no more than 100 mm between the bottom of the gate and the ground; - Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill must be provided beneath the gate; - Original tension must be maintained in the fence wires; - All gates installed in electrified fencing must be re-electrified; - All demarcation fencing and barriers must be maintained in good working order for the duration of the development activities; - Fencing must be erected around the camp, batching plants, hazardous storage areas, and all designated access restricted areas, where applicable; - Any temporary fencing to restrict the movement of life-stock must only be erected with the permission of the land owner. - All fencing must be developed of high quality material bearing the SABS mark; 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<ul style="list-style-type: none"> - The use of razor wire as fencing must be avoided; - Fenced areas with gate access must remain locked after hours, during weekends and on holidays if staff is away from site. Site security will be required at all times; - On completion of the development phase all temporary fences are to be removed; - The contractor must ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely. 						
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5.6 Water Supply Management

Impact management outcome: Undertake responsible water usage.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured on a daily basis; - The Contractor must ensure the following: <ul style="list-style-type: none"> a. The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river; b. No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities; and c. All reasonable measures to limit pollution or sedimentation of the downstream watercourse are 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<p>implemented.</p> <ul style="list-style-type: none"> - Ensure water conservation is being practiced by: <ul style="list-style-type: none"> a. Minimising water use during cleaning of equipment; b. Undertaking regular audits of water systems; and c. Including a discussion on water usage and conservation during environmental awareness training. d. The use of grey water is encouraged. 						
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5.7 Storm and waste water management

Impact management outcome: Impacts to the environment caused by storm water and wastewater discharges during construction are avoided.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Runoff from the cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the project manager; - All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility; - Natural storm water runoff not contaminated during the development and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO; - Water that has been contaminated with suspended solids, 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment must be subject to the Project Manager's approval and support by the ECO.						
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5.8 Solid and hazardous waste management

Impact management outcome: Wastes are appropriately stored, handled and safely disposed of at a recognised waste facility.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All measures regarding waste management must be undertaken using an integrated waste management approach; - Sufficient, covered waste collection bins (scavenger and weatherproof) must be provided; - A suitably positioned and clearly demarcated waste collection site must be identified and provided; - The waste collection site must be maintained in a clean and orderly manner; - Waste must be segregated into separate bins and clearly marked for each waste type for recycling and safe disposal; - Staff must be trained in waste segregation; - Bins must be emptied regularly; 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<ul style="list-style-type: none"> - General waste produced onsite must be disposed of at registered waste disposal sites/ recycling company; - Hazardous waste must be disposed of at a registered waste disposal site; - Certificates of safe disposal for general, hazardous and recycled waste must be maintained. 						
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5.9 Protection of watercourses and estuaries

Impact management outcome: Pollution and contamination of the watercourse environment and or estuary erosion are prevented.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All watercourses must be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities; - In the event of a spill, prompt action must be taken to clear the polluted or affected areas; - Where possible, no development equipment must traverse any seasonal or permanent wetland - No return flow into the estuaries must be allowed and no disturbance of the Estuarine functional Zone should occur; - Development of permanent watercourse or estuary crossing must only be undertaken where no alternative access to tower position is available; 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<ul style="list-style-type: none"> - There must not be any impact on the long term morphological dynamics of watercourses or estuaries; - Existing crossing points must be favored over the creation of new crossings (including temporary access) - When working in or near any watercourse or estuary, the following environmental controls and consideration must be taken: <ul style="list-style-type: none"> a) Water levels during the period of construction; No altering of the bed, banks, course or characteristics of a watercourse b) During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained; c) Where earthwork is being undertaken in close proximity to any watercourse, slopes must be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and d) Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows. 						
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5.10 Vegetation clearing

<p>Impact management outcome: Vegetation clearing is restricted to the authorised development footprint of the proposed infrastructure.</p>		
<p>Impact Management Actions</p>	<p>Implementation</p>	<p>Monitoring</p>

	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<p>General:</p> <ul style="list-style-type: none"> - Indigenous vegetation which does not interfere with the development must be left undisturbed; - Protected or endangered species may occur on or near the development site. Special care should be taken not to damage such species; - Search, rescue and replanting of all protected and endangered species likely to be damaged during project development must be identified by the relevant specialist and completed prior to any development or clearing; - Permits for removal must be obtained from the relevant CA prior to the cutting or clearing of the affected species, and they must be filed; - The Environmental Audit Report must confirm that all identified species have been rescued and replanted and that the location of replanting is compliant with conditions of approvals; - Trees felled due to construction must be documented and form part of the Environmental Audit Report; - Rivers and watercourses must be kept clear of felled trees, vegetation cuttings and debris; - Only a registered pest control operator may apply herbicides on a commercial basis and commercial application must be carried out under the supervision of a registered pest control operator, supervision of a registered pest control operator or is appropriately trained; - A daily register must be kept of all relevant details of 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<p>herbicide usage;</p> <ul style="list-style-type: none"> - No herbicides must be used in estuaries; - All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off in accordance to Section 5.3: Access restricted areas. <p>Alien invasive vegetation must be removed and disposed of at a licensed waste management facility.</p>						
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5.11 Protection of fauna

Impact management outcome: Disturbance to fauna is minimised.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - No interference with livestock must occur without the landowner's written consent and with the landowner or a person representing the landowner being present; - The breeding sites of raptors and other wild birds species must be taken into consideration during the planning of the development programme; - Breeding sites must be kept intact and disturbance to breeding birds must be avoided. Special care must be taken where nestlings or fledglings are present; - Special recommendations of the avian specialist must be adhered to at all times to prevent unnecessary disturbance of birds; - No poaching must be tolerated under any circumstances. 	<p>EPC Contractor</p>	<p>Compliance with EMPR / Method Statements</p>	<p>Duration of the construction phase</p>	<p>ECO / ESA</p>	<p>Daily</p>	<p>Monthly Environmental Control Reports</p>

<p>All animal dens in close proximity to the works areas must be marked as Access restricted areas;</p> <ul style="list-style-type: none"> - No deliberate or intentional killing of fauna is allowed; - In areas where snakes are abundant, snake deterrents to be deployed on the pylons to prevent snakes climbing up, being electrocuted and causing power outages; and - No Threatened or Protected species (ToPs) and/or protected fauna as listed according NEMBA (Act No. 10 of 2004) and relevant provincial ordinances may be removed and/or relocated without appropriate authorisations/permits. 						
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5.12 Protection of heritage resources

Impact management outcome: Impact to heritage resources is minimised.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure in Section 5.3: Access restricted areas; - Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; - All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences.						
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5.13 Safety of the public

Impact management outcome: All precautions are taken to minimise the risk of injury, harm or complaints.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.; - All unattended open excavations must be adequately fenced or demarcated; - Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding; - Ensure structures vulnerable to high winds are secured; - Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.14 Sanitation

Impact management outcome: Clean and well maintained toilet facilities are available to all staff in an effort to minimise the risk of disease and impact to the environment.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Mobile chemical toilets are installed onsite if no other ablution facilities are available; - The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances; - Where mobile chemical toilets are required, the following must be ensured: <ul style="list-style-type: none"> a) Toilets are located no closer than 100 m to any watercourse or water body; b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr; d) Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out; e) Toilets are emptied before long weekends and workers holidays, and must be locked after working hours; f) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards; - A copy of the waste disposal certificates must be maintained. 	EPC Contractor	Compliance with EMPr / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.15 Prevention of disease

Impact Management outcome: All necessary precautions linked to the spread of disease are taken.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Undertake environmentally-friendly pest control in the camp area; - Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS; - The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area; - Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable; - Free condoms must be made available to all staff on site at central points; - Medical support must be made available; - Provide access to Voluntary HIV Testing and Counselling Services. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.16 Emergency procedures

Impact management outcome: Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project; - The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation; - All staff must be made aware of emergency procedures as part of environmental awareness training; - The relevant local authority must be made aware of a fire as soon as it starts; - In the event of emergency necessary mitigation measures to contain the spill or leak must be implemented (see Hazardous Substances section 5.17). 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.17 Hazardous substances

<p>Impact management outcome: Safe storage, handling, use and disposal of hazardous substances.</p>						
Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives 	EPC Contractor	Compliance with EMPR / Method	Duration of the construction	ECO / ESA	Daily	Monthly Environment

<p>substituted where possible;</p> <ul style="list-style-type: none"> - All hazardous substances must be stored in suitable containers as defined in the Method Statement; - Containers must be clearly marked to indicate contents, quantities and safety requirements; - All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers; - Bunded areas to be suitably lined with a SABS approved liner; - An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis; - All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS); - All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet; - Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment must be made available; - The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; - The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); 		Statements	phase			al Control Reports
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<ul style="list-style-type: none"> - The floor of the bund must be sloped, draining to an oil separator; - Provision must be made for refueling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained; - All empty externally dirty drums must be stored on a drip tray or within a bund area; - No unauthorised access into the hazardous substances storage areas must be permitted; - No smoking must be allowed within the vicinity of the hazardous storage areas; - Adequate fire-fighting equipment must be made available at all hazardous storage areas; - Where refueling away from the dedicated refueling station is required, a mobile refueling unit must be used. Appropriate ground protection such as drip trays must be used; - An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance must be available at all times; - The responsible operator must have the required training to make use of the spill kit in emergency situations; - An appropriate number of spill kits must be available and must be located in all areas where activities are being undertaken; - In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to Section 5.7 for procedures concerning storm and waste water management and 5.8 for solid and hazardous waste management. 						
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5.18 Workshop, equipment maintenance and storage

Impact management outcome: Soil, surface water and groundwater contamination is minimised.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area; - During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil. The relevant local authority must be made aware of a fire as soon as it starts; - Leaking equipment must be repaired immediately or be removed from site to facilitate repair; - Workshop areas must be monitored for oil and fuel spills; - Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place must be available; - The workshop area must have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed; - Water drainage from the workshop must be contained and managed in accordance Section 5.7: Storm and waste water management. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.19 Batching plants

Impact management outcome: Minimise spillages and contamination of soil, surface water and groundwater.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Concrete mixing must be carried out on an impermeable surface; - Batching plants areas must be fitted with a containment facility for the collection of cement laden water. - Dirty water from the batching plant must be contained to prevent soil and groundwater contamination - Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains; - A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted; - Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility; - Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site; - Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer to Section 5.20: Dust emissions) - Any excess sand, stone and cement must be removed or 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<p>reused from site on completion of construction period and disposed at a registered disposal facility;</p> <ul style="list-style-type: none"> Temporary fencing must be erected around batching plants in accordance with Section 5.5: Fencing and gate installation. 						
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5.20 Dust emissions

Impact management outcome: Dust prevention measures are applied to minimise the generation of dust.						
Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> Take all reasonable measures to minimise the generation of dust as a result of project development activities to the satisfaction of the ECO; Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible; Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present; During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; Where possible, soil stockpiles must be located in sheltered 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<p>areas where they are not exposed to the erosive effects of the wind;</p> <ul style="list-style-type: none"> - Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO; - Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas; - Straw stabilisation must be applied at a rate of one bale/10 m² and harrowed into the top 100 mm of top material, for all completed earthworks; - For significant areas of excavation or exposed ground, dust suppression measures must be used to minimise the spread of dust. 						
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5.21 Blasting

Impact management outcome: Impact to the environment is minimised through a safe blasting practice.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Any blasting activity must be conducted by a suitably licensed blasting contractor; and - Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.22 Noise

Impact Management outcome: Prevent unnecessary noise to the environment by ensuring that noise from development activity is mitigated.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - The Contractor must keep noise level within acceptable limits, Restrict the use of sound amplification equipment for communication and emergency only; - All vehicles and machinery must be fitted with appropriate silencing technology and must be properly maintained; - Any complaints received by the Contractor regarding noise must be recorded and communicated. Where possible or applicable, provide transport to and from the site on a daily basis for construction workers; - Develop a Code of Conduct for the construction phase in terms of behaviour of construction staff. Operating hours as determined by the environmental authorisation are adhered to during the development phase. Where not defined, it must be ensured that development activities must still meet the impact management outcome related to noise management. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.23 Fire prevention

Impact management outcome: Prevention of uncontrollable fires.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Designate smoking areas where the fire hazard could be regarded as insignificant; - Firefighting equipment must be available on all vehicles located on site; - The local Fire Protection Agency (FPA) must be informed of construction activities; - Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site; - Two way swop of contact details between ECO and FPA. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.24 Stockpiling and stockpile areas

Impact management outcome: Reduce erosion and sedimentation as a result of stockpiling.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All material that is excavated during the project development phase (either during piling (if required) or earthworks) must be stored appropriately on site in order to minimise impacts to watercourses, watercourses and water bodies; - All stockpiled material must be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods; - Topsoil stockpiles must not exceed 2 m in height; - During periods of strong winds and heavy rain, the stockpiles must be covered with appropriate material (e.g. cloth, tarpaulin etc.); - Where possible, sandbags (or similar) must be placed at the bases of the stockpiled material in order to prevent erosion of the material. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.25 Civil works

Impact management outcome: Impact to the environment minimised during civil works to create the substation terrace.

Impact Management Actions	Implementation			Monitoring		
	Responsible	Method of	Timeframe for	Responsible	Frequency	Evidence of

	person	implementation	implementation	person		compliance
<ul style="list-style-type: none"> - Where terracing is required, topsoil must be collected and retained for the purpose of re-use later to rehabilitate disturbed areas not covered by yard stone; - Areas to be rehabilitated include terrace embankments and areas outside the high voltage yards; - Where required, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled; - These areas can be stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; - Rehabilitation of the disturbed areas must be managed in accordance with Section 5.35: Landscaping and rehabilitation; - All excess spoil generated during terracing activities must be disposed of in an appropriate manner and at a recognised landfill site; and - Spoil can however be used for landscaping purposes and must be covered with a layer of 150 mm topsoil for rehabilitation purposes. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.26 Excavation of foundation, cable trenching and drainage systems



Impact management outcome: No environmental degradation occurs as a result of excavation of foundation, cable trenching and drainage systems.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All excess spoil generated during foundation excavation must be disposed of in an appropriate manner and at a licensed landfill site, if not used for backfilling purposes; - Spoil can however be used for landscaping purposes and must be covered with a layer of 150 mm topsoil for rehabilitation purposes; - Management of equipment for excavation purposes must be undertaken in accordance with Section 5.18: Workshop, equipment maintenance and storage; and - Hazardous substances spills from equipment must be managed in accordance with Section 5.17: Hazardous substances. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.27 Installation of foundations, cable trenching and drainage systems

Impact management outcome: No environmental degradation occurs during the installation of foundation, cable trenching and drainage system.

Impact Management Actions	Implementation	Monitoring
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	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> – Batching of cement to be undertaken in accordance with Section 5.19: Batching plants; and – Residual solid waste must be disposed of in accordance with Section 5.8: Solid waste and hazardous management. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.28 Installation of equipment (circuit breakers, current Transformers, Isolators, Insulators, surge arresters, voltage transformers, earth switches)

Impact management outcome: No environmental degradation occurs as a result of installation of equipment.						
Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> – Management of dust must be conducted in accordance with Section 5.20: Dust emissions; – Management of equipment used for installation must be conducted in accordance with Section 5.18: Workshop, equipment maintenance and storage; – Management hazardous substances and any associated spills must be conducted in accordance with Section 5.17: Hazardous substances; and – Residual solid waste must be recycled or disposed of in accordance with Section 5.8: Solid waste and hazardous management. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.29 Steelwork Assembly and Erection

Impact management outcome: No environmental degradation occurs as a result of steelwork assembly and erection.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> – During assembly, care must be taken to ensure that no wasted/unused materials are left on site e.g. bolts and nuts – Emergency repairs due to breakages of equipment must be managed in accordance with Section 5.18: Workshop, equipment maintenance and storage and Section 5.16: Emergency procedures. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.30 Cabling and Stringing

Impact management outcome: No environmental degradation occurs as a result of stringing.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance

<ul style="list-style-type: none"> - Residual solid waste (off cuts etc.) shall be recycled or disposed of in accordance with Section 6.8: Solid waste and hazardous Management; - Management of equipment used for installation shall be conducted in accordance with Section 5.18: Workshop, equipment maintenance and storage; - Management hazardous substances and any associated spills shall be conducted in accordance with Section 5.17: Hazardous substances. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports
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5.31 Testing and Commissioning (all equipment testing, earthing system, system integration)

Impact management outcome: No environmental degradation occurs as a result of Testing and Commissioning.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Residual solid waste must be recycled or disposed of in accordance with Section 5.8: Solid waste and hazardous management. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.32 Socio-economic

Impact management outcome: enhanced socio-economic development.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - Develop and implement communication strategies to facilitate public participation; - Develop and implement a collaborative and constructive approach to conflict resolution as part of the external stakeholder engagement process; - Sustain continuous communication and liaison with neighboring owners and residents - Create work and training opportunities for local stakeholders; and - Where feasible, no workers, with the exception of security personnel, must be permitted to stay over-night on the site. This would reduce the risk to local farmers. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.33 Temporary closure of site

Impact management outcome: Minimise the risk of environmental impact during periods of site closure greater than five days.						
Impact Management Actions	Implementation			Monitoring		
	Responsible	Method of	Timeframe for	Responsible	Frequency	Evidence of

	person	implementation	implementation	person		compliance
<ul style="list-style-type: none"> - Bunds must be emptied (where applicable) and need to be undertaken in accordance with the impact management actions included in sections 5.17: Hazardous substances and 5.18: Workshop, equipment maintenance and storage; - Hazardous storage areas must be well ventilated; - Fire extinguishers must be serviced and accessible. Service records to be filed and audited at last service; - Emergency and contact details displayed must be displayed; - Security personnel must be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel; - Night hazards such as reflectors, lighting, traffic signage etc. must have been checked; - Fire hazards identified and the local authority must have been notified of any potential threats e.g. large brush stockpiles, fuels etc.; - Structures vulnerable to high winds must be secured; - Wind and dust mitigation must be implemented; - Cement and materials stores must have been secured; - Toilets must have been emptied and secured; - Refuse bins must have been emptied and secured; - Drip trays must have been emptied and secured. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.34 Dismantling of old equipment

Impact management outcome: Impact to the environment to be minimised during the dismantling, storage and disposal of old equipment commissioning.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All old equipment removed during the project must be stored in such a way as to prevent pollution of the environment; - Oil containing equipment must be stored to prevent leaking or be stored on drip trays; - All scrap steel must be stacked neatly and any disused and broken insulators must be stored in containers; - Once material has been scrapped and the contract has been placed for removal, the disposal Contractor must ensure that any equipment containing pollution causing substances is dismantled and transported in such a way as to prevent spillage and pollution of the environment; - The Contractor must also be equipped to contain and clean up any pollution causing spills; and - Disposal of unusable material must be at a licensed waste disposal site. 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

5.35 Landscaping and rehabilitation

Impact management outcome: Areas disturbed during the development phase are returned to a state that approximates the original condition.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> - All areas disturbed by construction activities must be subject to landscaping and rehabilitation; All spoil and waste must be disposed of to a registered waste site; - All slopes must be assessed for contouring, and to contour only when the need is identified in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983 - All slopes must be assessed for terracing, and to terrace only when the need is identified in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; - Berms that have been created must have a slope of 1:4 and be replanted with indigenous species and grasses that approximates the original condition; - Where new access roads have crossed cultivated farmlands, that lands must be rehabilitated by ripping which must be agreed to by the holder of the EA and the landowners; - Rehabilitation of access roads outside of farmland; - Indigenous species must be used for with species and/grasses to where it compliments or approximates the original condition; - Stockpiled topsoil must be used for rehabilitation (refer to Section 5.24: Stockpiling and stockpiled areas); - Stockpiled topsoil must be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion; - Before placing topsoil, all visible weeds from the placement area and from the topsoil must be removed; - Subsoil must be ripped before topsoil is placed; 	EPC Contractor	Compliance with EMPR / Method Statements	Duration of the construction phase	ECO / ESA	Daily	Monthly Environmental Control Reports

<ul style="list-style-type: none"> - The rehabilitation must be timed so that rehabilitation can take place at the optimal time for vegetation establishment; - Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled; - Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; - Spoil can be used for backfilling or landscaping as long as it is covered by a minimum of 150 mm of topsoil. - Where required, re-vegetation including hydro-seeding can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: <ul style="list-style-type: none"> a) Annual and perennial plants are chosen; b) Pioneer species are included; c) Species chosen must be indigenous to the area with the seeds used coming from the area; d) Root systems must have a binding effect on the soil; e) The final product must not cause an ecological imbalance in the area 						
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6 ACCESS TO THE GENERIC EMPr

Once completed and signed, to allow the public access to the generic EMPr, the holder of the EA must make the EMPr available to the public in accordance with the requirements of Regulation 26(h) of the EIA Regulations.

PART B: SECTION 2

7 SITE SPECIFIC INFORMATION AND DECLARATION

7.1 Sub-section 1: contact details and description of the project

7.1.1 Details of the applicant:

Name of applicant: Aristida PV (Pty), Themeda PV (Pty) Ltd

Tel No: 27 (21) 418 2596

Fax No: + 27 (0) 86 611 0882

Postal Address: 101, Block A, West Quay Building

7 West Quay Road, Waterfront

Cape Town, 8000

Physical Address: 101, Block A, West Quay Building

7 West Quay Road, Waterfront

Cape Town, 8000

7.1.2 Details and expertise of the EAP:

Name of EAP: Dale Holder (Cape Environmental Assessment Practitioners)

Tel No: 044 8740365

Fax No: 044 884 0432

E-mail address: dale@cape-eaprac.co.za

Expertise of the EAP (Curriculum Vitae included):

7.1.3 Project name: Aristida PV, Themeda PV

This EMPr must be read in conjunction with the overarching EMP'r for the larger project

7.2 Sub-section 2: Development footprint site map

This sub-section must include a map of the site sensitivity overlaid with the preliminary infrastructure layout. The sensitivity map must be prepared from the national web based environmental screening tool, when available for compulsory use at: <https://screening.environment.gov.za/screeningtool>. The sensitivity map shall identify the nature of each sensitive feature e.g. threatened plant species, archaeological site, etc. Sensitivity maps shall identify features both within the planned working area and any known sensitive features within 50 m from the development footprint.

Appendix A includes the final Site layout plan that shows all the sensitive features in the vicinity of this infrastructure.

7.3 Sub-section 3: Declaration

The proponent/applicant or holder of the EA affirms that he/she will abide and comply with the prescribed impact management outcomes and impact management actions as stipulated in part B: section 1 of the generic EMPr and have the understanding that the impact management outcomes and impact management actions are legally binding. The proponent/applicant or holder of the EA affirms that he/she will provide written notice to the CA 14 day prior to the date on which the activity will commence of commencement of construction to facilitate compliance inspections.

Signature Proponent/applicant/ holder of EA

Date: 15 August 2022



7.4 Sub-section 4: amendments to site specific information (Part B; section 2)

Should the EA be transferred to a new holder, Part B: Section 2 must be completed by the new holder and submitted with the application for an amendment of the EA in terms of Regulations 29 or 31 of the EIA Regulations, whichever applies. The information submitted for an amendment to an environmental authorisation will be considered to be incomplete should a signed copy of Part B: Section 2 not be submitted. Once approved, Part B: Section 2 forms part of the EMPr for the development and the EMPr becomes legally binding to the new EA holder.

PART C

8 SITE SPECIFIC ENVIRONMENTAL ATTRIBUTES

If any specific environmental sensitivities/attributes are present on the site which require more specific impact management outcomes and actions, not included in the pre-approved generic EMPr template, to manage impacts, those impact management outcomes and impact management actions must be included in this section. These specific management controls must be referenced spatially, and must include impact management outcomes and impact management actions. The management controls including impact management outcomes and impact management actions must be presented in the format of the pre-approved generic EMPr template. This applies only to additional impact management outcomes and impact management actions that are necessary.

If Part C is applicable to the development as authorised in the EA, it is required to be submitted to the CA together with the BAR or EIAR, for consideration of, and decision on, the application for EA. The information in this section must be prepared by an EAP and the name and expertise of the EAP, including the curriculum vitae are to be included. Once approved, Part C forms part of the EMPr for the site and is legally binding.

This section will **not be required** should the site contain no specific environmental sensitivities or attributes.

The site specific attributes are included in the main EMPr which must be read in conjunction with this generic EMPr

APPENDIX 1: METHOD STATEMENTS

To be prepared by the contractor prior to commencement of the activity. The method statements are **not required** to be submitted to the CA.



THEMEDA PV (PTY) LTD

THEMEDA PV

Stormwater Management Plan

Issue Date: 5th August 2022
Revision No: 1
Project No: 17718
Document No: SW_T

Date:	5 th August 2022	
Document Title:	Themeda PV Stormwater Management Plan	
Revision Number:	1	
Author:	Merchandt Le Maitre (Pr. Tech Eng.)	
Signature:	 Pr. N°: 2018300094	Date: 5 th August 2022
Reviewed:	Richard Hirst (Pr Tech Eng.)	
Signature:	 Pr. N°: 2018300110	Date: 5 th August 2022
For:	THEMEDA PV (PTY) LTD	
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EXECUTIVE SUMMARY

Objective

The Applicant, Themeda PV (Pty) Ltd, proposes the construction of a photovoltaic (PV) solar energy facility, known as the Themeda PV facility, located on a site \pm 7.5 km west of Lichtenburg in the North West Province. The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality and is accessible via the R503, located immediately southwest of the development area. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 120 MW.

The main objective of the 'Stormwater Management Plan' is to determine the impact/s of the proposed development on the immediate and greater area concerning stormwater and to include these findings in the Environmental Impact Assessment (EIA) submission. The assessment will comprise a desktop assessment and include preliminary stormwater-related matters arising during the construction phase, through the Operation & Maintenance Phase, up to and including the decommissioning phase of the development.

The proposed Themeda PV Facility forms part of cluster development with an additional development adjacent to this facility as a separate EIA application: - Aristida PV. Although this report only focuses on the Themeda PV Facility, all two developments are considered for this study as they share common boundaries adjacent to each other.

Key Findings

No significant risks concerning the proposed development are foreseen, provided the recommendations below are noted before and during the detailed design and construction stages. Furthermore, several recommendations were highlighted and therefore noted as important.

The proposed development / infrastructure will have a minimal impact on the stormwater quality and quantities post-development (operational phase). This development's construction phase typically generates the highest surface run-off during the construction phases coinciding with the wet season. However, it will be temporary, and impacts can be mitigated and considered nominal. The post-development stormwater flow from the operation phase will have a minimal impact on the immediate environment if adequate stormwater designs are implemented to maintain existing drainage patterns and flows in the catchment.

Many mitigation measures are proposed to accommodate the development and reduce the impact on the surrounding area.

Recommendation

Concerning this report, the associated assessment and the findings made within, it is SiVEST's opinion that the Themeda PV will have a nominal impact on the existing stormwater catchment. The project is therefore deemed acceptable from a stormwater perspective, provided the recommendations and mitigation measures in this report are implemented. Hence, Environmental Authorisation (EA) should be granted for the EIA application.

This document should also be read in conjunction with the EMP. The developer, owner, and professional team must adhere to the requirements and conditions set out in the EMP.

DECLARATION BY SPECIALIST

I, MERCHANDT LE MAITRE, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of Specialist:

Name of Company: SiVEST SA (PTY) Ltd

Date: 5th August 2022

THEMEDA PV (PTY) LTD

THEMEDA PV FACILITY

STORMWATER MANAGEMENT PLAN

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1. INTRODUCTION

SiVEST Civil Engineering Division has been appointed by Themeda PV (Pty) Ltd (hereafter referred to as "Themeda PV") to complete a Stormwater Management Plan (SWMP) for the proposed 120MW Themeda PV Facility and associated grid infrastructure (hereafter the "proposed facility / facilities") situated ± 7.5 km west of the town Lichtenburg and is within the Ditsobotla Local Municipality, the greater Ngaka Modiri Molema District Municipality of the North West Province.

The proposed facility and associated grid infrastructure north of Vryburg & Klerksdorp will not be located within Renewable Energy Development Zones (REDZ). The development is however located north of the existing 'Vryburg REDZ' and the existing 'Klerksdorp REDZ'.

The proposed Themeda PV Facility forms part of cluster development with an additional development adjacent to this facility as a separate EIA application: - Aristida PV. Although this report only focuses on the Themeda PV Facility, all two developments are considered for this study as they share common boundaries adjacent to each other.

2. PV FACILITY COMPONENTS

The PV facility will consist of the following:

2.1 Solar Farm Components

The proposed Themeda PV will comprise photovoltaic (PV) panels with a maximum total energy generation capacity of up to 120 MW. The electricity generated by the proposed PV development will be fed into the national grid via a 132 kV overhead power line. In summary, the proposed Themeda PV will include the following components:

- PV panels (number of will be determined in the design phase), connected in series to form a 'string' of panels. Several strings are connected in parallel to form an 'array of modules / panels', each typically between 4 MW and 7 MW, with a maximum export capacity of 120 MW. However, the final number of panels and layout of the PV will depend on the outcome of the Specialist Studies conducted during the EIA process, and detailed design process to be conducted in due course.
- Mounting structures that are either fixed, north-facing at a defined angle or single-axis tracking modules rotating in an east-west direction will be considered. (Will be determined at the design stage)
- Medium voltage electrical transformers (up to 33 kV) adjacent to each inverter station (typical footprint of up to approximately 3 m x 2.5 m) step up the voltage to between 11 kV and 33 kV.
- One (1) new up to 132 kV on-site substation including associated equipment and infrastructure.
- A Battery Energy Storage System (BESS) will be located next to the on-site 33/132 kV substation. The storage capacity and type of technology would be determined later during the development phase but most likely will comprise an array of containers and outdoor cabinets.
- A single inverter station is connected to several 'solar arrays' placed adjacent to the internal road.
- The inverter station will be connected to the proposed substation via medium voltage (up to 33 kV) cables. Cables will be buried underground along access roads wherever technically feasible.
- An overhead line servitude of up to 36 m wide for the the 132 kV line (to be located within a 100 m wide assessment corridor).
- Internal roads up to approximately 8 m wide will provide access to each PV panel and inverter station. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.

- One (1) construction laydown area of up to approximately ± 3.0 ha. It should be noted that no construction camps will be required to house workers overnight as all workers will be accommodated in the nearby town.
- Operation and Maintenance (O&M) buildings, including offices, a guard house, operational control centre, O&M area / warehouse / workshop, canteen, visitor centre, and ablution facilities to be located on the site identified as Auxiliary Buildings. This site area is approximately ± 1.0 ha.
- A new ± 2.0 m high perimeter fence around the site perimeter will be erected.
- Water will be sourced from existing boreholes within the application site or trucked in should the boreholes within the application site be limited.

3. OBJECTIVE & SCOPE OF WORK

The study's main objective is to develop a conceptual stormwater management plan for the proposed development during the operation & maintenance phase. To achieve this objective, the following will be assessed and discussed under their relevant headings in this report: -

- Climate
- Surface Hydrology
- Development Stormwater Management
- Development run-off Calculations
- Conclusions & Recommendations

The scope of work consists of the following:

- a) A site investigation (Completed on March 30 2022)
- b) Consultations with the relevant authorities and / or stakeholders.
- c) Extract the climate of the area from sources commonly available
- d) Desktop analysis of the existing surface hydrology
- e) Evaluate the impact of the proposed development on the existing catchment and propose a suitable SWMP.
- f) Conclude & propose possible mitigation measures.
- g) Seasonal impacts affect this assessment.

3.1 Legal Requirement & Guidelines

Key legal requirements and guidelines for the proposed facilities are as follows:

- Government Notice 509 (GN509) as published in Government Gazette 40229 of 2016 and refers to the National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA)
- National Water Act, 1998 (Act No 36 of 1998) (NWA)

4. SPECIALIST CREDENTIALS

Merchandt Le Maitre from SIVEST Consulting Engineers compiled this Stormwater Management Plan. He has a B Tech (Baccalaureus Technologiae) in Civil Engineering with over 17 years of experience, with 12 years in renewable energy. His extensive experience in the different facets of Civil Engineering means he can advise clients in the renewable energy sector in; geotechnical engineering, topographical studies, stormwater management, water demand, transportation studies, access / layout designs and glint & glare assessments. A full Curriculum Vitae is included in 'Appendix A.

Table 4:1 Specialist Credentials & Experience

Company	SiVEST (Pty) Ltd
Contact Details	merchandtm@sivest.co.za
Qualifications	B Tech (Baccalaureus Technologiae) in Civil Engineering
Professional Registrations & Memberships	Pr. Tech Eng – Engineering Council of South Africa MSAICE – Member of South African Institute of Civil Engineers SAWEA – South African Wind Energy Association
Expertise to carry out the Stormwater Management Plan	Dyansons Klip 5 De Aar Solar Droogfontein Solar Mierdam Solar Prieska PV Hoekplaas PV Noupoort WEF Copperton PV Klipgats PV

5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are to be noted:

- The analysis is based on the information Themeda PV (Pty) Ltd. and its representatives provided at the time.
- Digital Terrain Model: 25m DEM from NGI (2014) & 2m DEM from GeoSmart (2016:2626AA)
- Technical Specifications for the Facility:

Table 5:1 Technical Specification for Themeda PV Facility

Technical Component	Dimensions
PV Tracking System	Fixed axis tracking has been used for these simulations as it has the most significant impact on the surrounding road network
Height of PV Panels	≤ 5.5 m
Area of PV Array	± 251 ha
Number of Panels and Inverters	To be determined at the detailed design phase
Area of Inverter / Transformer stations / substations /	The inverter / transformer stations will be located within the area of the PV array, while the main HV transformers will be located within the substation complex
BESS	Up to 4 ha
Voltage of Substation Complex	11 kV / 132 kV – 33 Kv / 132 kV
Area of Substation Complex	≤ 3 ha
Height of Substation Complex	≤ 25 m
The area occupied by laydown areas (Permanent and Construction)	Temporary Laydown Area: ± 5 ha (per facility)

Technical Component	Dimensions
	Permanent Laydown Area: Less than ± 1 ha will remain in place for operations (per facility)
The area occupied by Buildings	≤ 1 ha for a site office and O&M buildings
Length of Access Road	≤ 3 km
Width of Access Road	Up to 8 m
Length of Internal Roads	≤ 25 km
Width of Internal Roads	Up to 8 m
Construction Period	± 12 months

6. PROJECT DESCRIPTION

6.1 Locality

Themeda PV facility and associated infrastructure are located ± 7.5 km west of Lichtenburg in the North West Province. The facility is adjacent to Road R503 regional road (P28-4) between Lichtenburg and Mahikeng (Refer to **Figure 6:2**) in the Ditsobotla Local Municipality and greater Ngaka Modiri Molema District Municipality, as indicated in **Figure 6:1**.

Figure 6:1 Themeda PV - Regional Context

The development area for the PV facility and associated infrastructure will be located on the following properties (Refer to **Figure 6:2**):

- Portion 7 of the Farm Elandsfontein 34

Figure 6:2 Themeda PV - Site Locality ()

7. GEOTECHNICAL STUDY

A comprehensive Palaeontological Impact Assessment¹ for the proposed development was completed in March 2022 by Prof Marion Bamford for Messrs' Beyond Heritage (Pty) Ltd on the proposed sites indicated in **Section 6**.

A summary extract from the Palaeontological Impact Assessment confirms the site comprises the following geological context. Refer to **Figure 7:1** and **Table 7:1**:

¹ Van Der Walt, J (2022). Heritage Baseline Report: For the Elandsfontein PV Cluster (Themeda PV and Aristida PV), Lichtenburg, North-West Province. Beyond Heritage.



Figure 7:1 Geological Map of Proposed Development Area

Abbreviations of the rock types are explained in **Table 7:1** below:

Table 7:1 Explanation of Figure 7:1 and Approximate Ages

Symbol	Group / Formation	Lithology	Approximate Age
Qs	Quaternary	Alluvium, Sand, and Calcrete	Neogene, ca 2.5 Million years (Ma) to present
Qc	Quaternary Calcrete	Calcrete and Sand	Neogene, ca 2.5 Ma to present
C-Pd	Dwyka Group	Diamictites, Tillites, Mudstone, and Shales	Early Permian, Middle Ecca. Ca 280-270 Ma
Vml	Transvaal Super Group, Chuniespoort Group, Malmani Subgroup, and Littleton Formation	Dark Chert (Poor Dolomite)	Ca 2585 – 2480 Ma
Vmm	Transvaal Super Group, Chuniespoort Group, Malmani Subgroup, and Monte Christo Formation	Dark Chert (Poor Dolomite)	Ca 2585 – 2480 Ma
Vo	Transvaal Super Group, Chuniespoort Group, Malmani Subgroup, and	Dark Chert (Free Dolomite)	Ca 2585 – 2480 Ma

Symbol	Group / Formation	Lithology	Approximate Age
	Oaktree Formation		
Vbr	Transvaal Super Group, and Black Reef Formation	Quartzite, Conglomerate, and Shale	< 2618 Ma

In summary, the facility will have the following typical soil profile: -

- *Alluvium, Sand, and Calcrete (red soil)* covering the site
- *Chert-rich & poor dolomite underlying the red alluvium sand with exposed dolomite in patches.*

Material excavation (soils and sand) is expected to be soft in the upper layers of alluvium / sand with *intermediate to hard* excavation techniques below in the dolomites.

We recommend that a comprehensive Geotechnical Report be carried out to form part of the detailed design stage and refinement of the SWMP.

8. CLIMATE

8.1 Climate Classification²

Themeda PV is located ± 7.5 km west of Lichtenburg in the North West Province. Referring to the Klöppen-Geiger climate classification system, the North West Province has a variety of climates and is predominantly dominated by hot semi-arid climates (type 'BSh'). However, the Lichtenburg area is classified as a cold semi-arid climate (type 'BSk').

8.2 Average Temperature³

The Average Maximum temperatures range between 17.9 °C and 28.5 °C. December is the warmest month of the year, with an average high temperature of 28.5 °C. The coldest month of the year with an average low temperature of 5.4 °C is the month of July. Refer to **Figure 8:1** below.

² en-climate-data

³ Weather Atlas

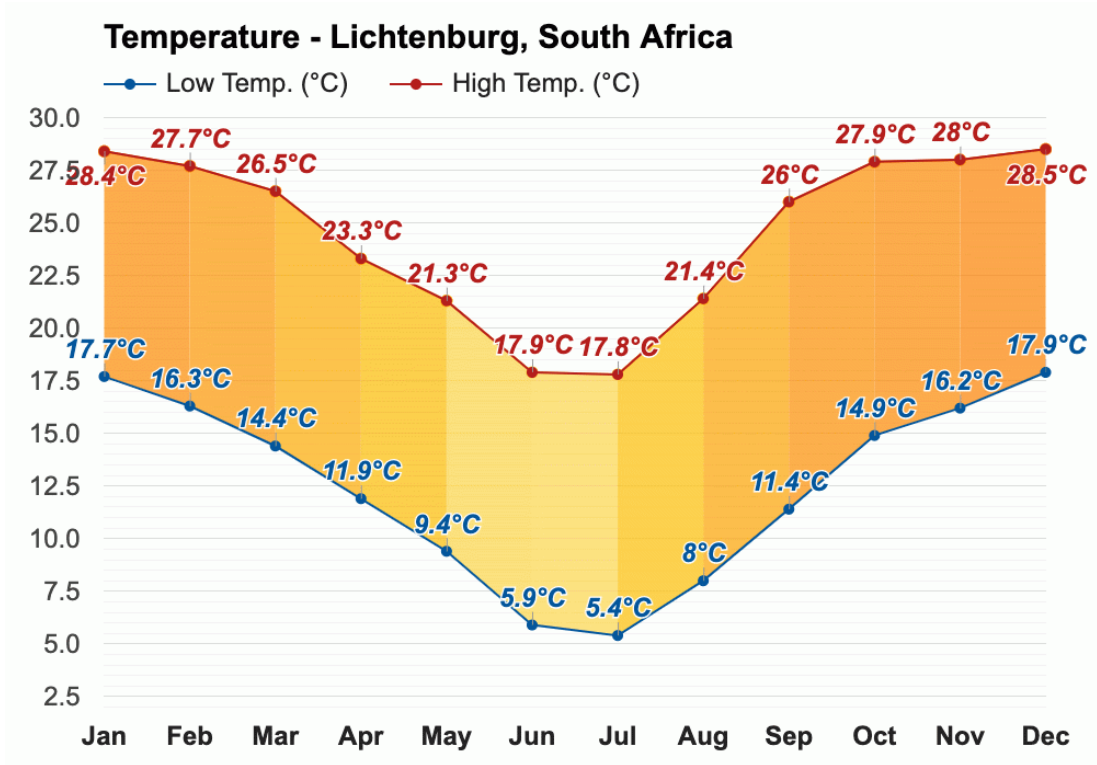


Figure 8:1 Average Temperature – Lichtenburg, South Africa

8.3 Mean Annual Precipitation (MAP)⁴

As mentioned in **Section 8.1** above, the Lichtenburg region is a cold semi-arid climate with an annual average rainfall of ± 351 mm, mainly between October and April. The month of December is on average, the wettest month of the year, with ± 72 mm accumulated for the month. The driest months with the least amount of rainfall of ± 1 mm accumulated for July and August, respectively. Refer to **Figure 8:2** below.

⁴ Weather Atlas

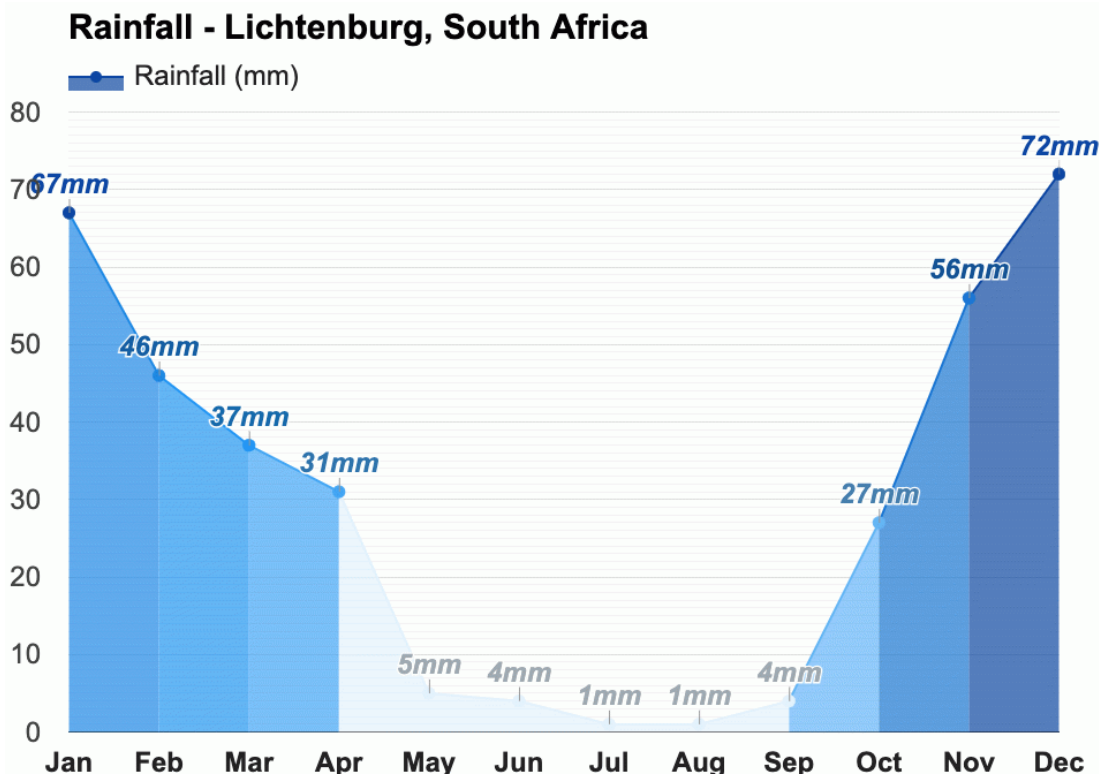


Figure 8:2 Average Rainfall – Lichtenburg, South Africa

The average rainfall days per annum is ± 101 days with January having the highest number of rainfall days (17.8 days). The month with the least number of rainfall days is August (0.8 days). Refer to **Figure 8:3** below.

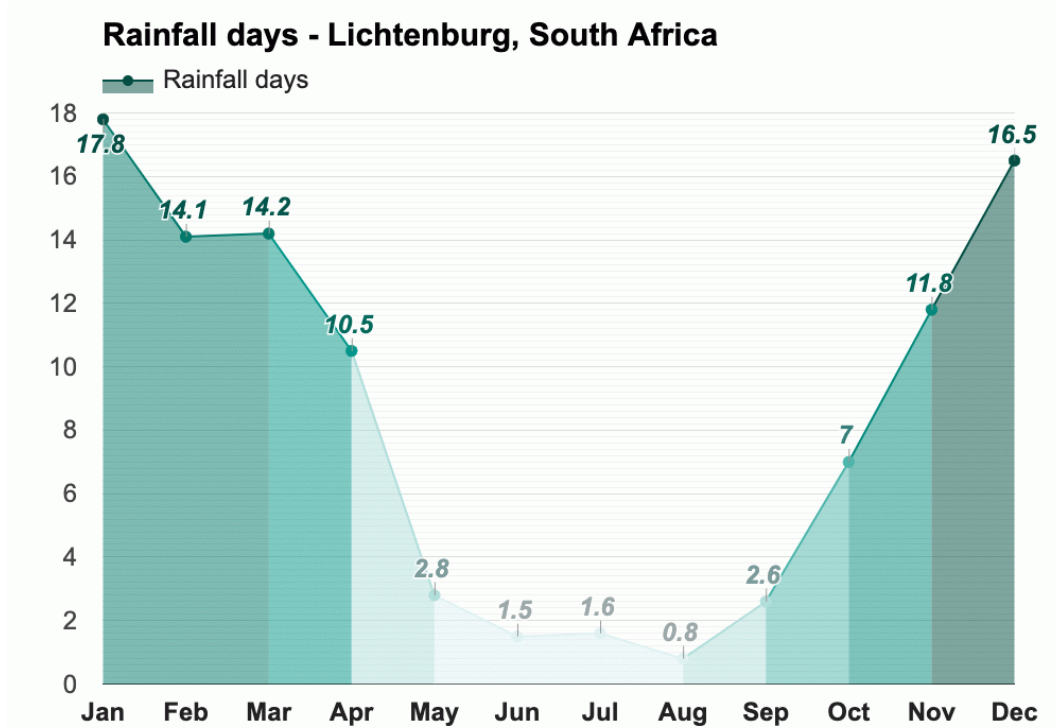


Figure 8:3 Average Rainfall Days – Lichtenburg, South Africa

8.4 Humidity⁵

The region's relative humidity ranges from a maximum of 61 % in February to a minimum of 31 % in September.

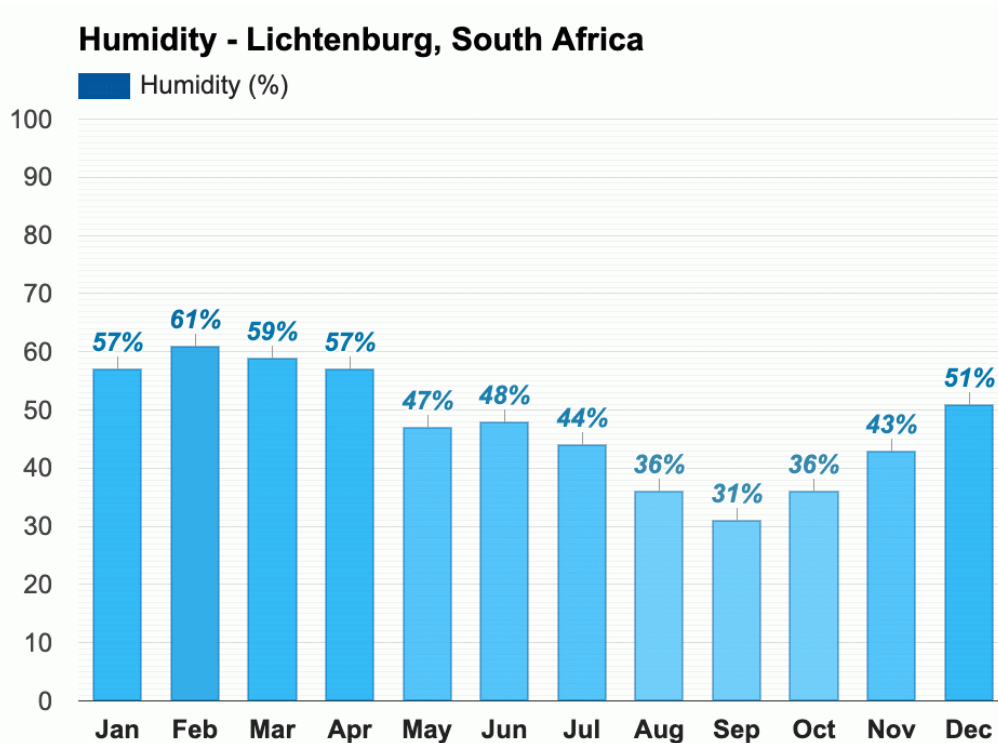


Figure 8:4 Average Relative Humidity – Lichtenburg, South Africa

8.5 Design Rainfall

Design Rainfall Estimation⁶ software was used to obtain the rainfall data (tabulated below in **Table 8:1**) required for the run-off calculations.

Table 8:1 Themeda PV Design Rainfall Data

Return Period		2yr	5yr	10yr	20yr	50yr	100yr	200yr
Duration		Rainfall Depth (mm)						
5	min	9.20	12.60	14.90	17.10	20.10	22.50	24.90
10	min	13.70	18.70	22.10	25.50	29.90	33.40	36.90
15	min	17.30	23.60	27.80	32.10	37.70	42.10	46.50
30	min	21.90	29.80	35.30	40.60	47.70	53.30	58.90
45	min	25.20	34.30	40.50	46.60	54.80	61.10	67.60
60	min	27.70	37.80	44.60	51.40	60.50	67.40	74.60
90	min	31.90	43.40	51.20	59.10	69.40	77.40	85.60
120	min	35.10	44.80	56.50	65.10	76.50	85.40	94.40
240	min	41.00	55.80	65.90	76.00	89.30	99.60	110.20
360	min	44.90	61.10	72.20	83.20	97.80	109.00	120.60

⁵ Weather Atlas

⁶ Design Rainfall Estimation in South Africa Version 3 developed by MJ Gorven, JC Smithers and RE Schulze

Return Period		2yr	5yr	10yr	20yr	50yr	100yr	200yr
Duration		Rainfall Depth (mm)						
480	min	47.80	65.10	77.00	88.70	104.20	116.30	128.60
600	min	50.30	68.40	80.90	93.20	109.50	122.20	135.10
720	min	52.40	71.30	84.20	97.10	114.10	127.20	140.70
960	min	55.80	76.00	89.80	103.50	121.60	135.70	150.00
1200	min	58.70	79.90	94.40	108.80	127.80	142.60	157.70
1440	min	61.10	83.20	98.30	113.30	133.10	148.50	164.20
1	day	50.80	69.20	81.70	94.20	110.70	123.50	136.50
2	days	62.50	85.10	100.50	115.80	136.10	151.80	167.90
3	days	70.50	96.00	113.40	130.70	153.60	171.40	189.50
4	days	76.40	104.00	122.90	141.70	166.50	185.70	205.40
5	days	81.40	110.80	130.90	150.80	177.20	197.70	218.60
6	days	85.60	116.60	137.70	158.70	186.50	208.10	230.10
7	days	89.40	121.70	143.80	165.70	194.80	217.30	240.20

9. SURFACE HYDROLOGY

9.1 Drainage of Catchment

9.1.1 Primary Catchment

The site falls within the 'Vaal River' drainage catchment (Primary Catchment 'C'), which covers an area of ± 192 000 km² and extends from the northern border of Lesotho, the Mpumalanga escarpment towards the east, Johannesburg CBD to the north and Douglas to the west as shown in **Figure 9:1** below.

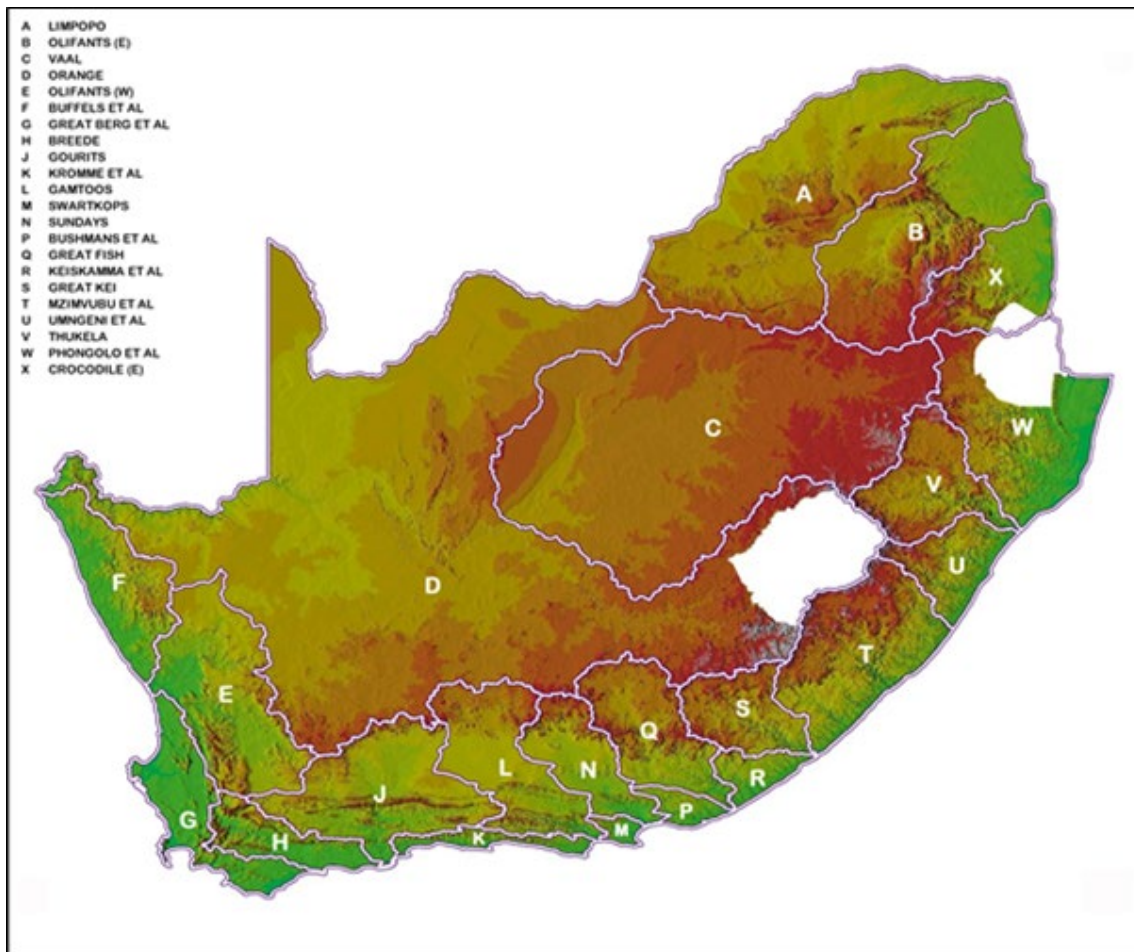


Figure 9:1 Department of Water and Sanitation (DWS) – Primary Catchments

9.2.1 Quaternary Catchment

The proposed facility is located in Quaternary Catchment C31A. This quaternary catchment forms part of the upper reaches of the Harts River, which then flows into the lower reaches of the Vaal River.

10. STORMWATER MANAGEMENT

10.1 Impact of Development⁷

Development is defined as the process of modification or evolution which historically involves the improvement / construction of buildings and civil infrastructure. A new development leads to an alteration in the hydraulic properties of the subjected area, changing surface run-off properties into pervious or impervious layers and subsequently increasing the surface run-off and altering inundation areas. Common historical stormwater infrastructure and surfaces are constructed to efficiently manage the run-off, resulting in shorter catchment response times and increased peak flows.

As a result of the proposed development, stormwater management is key to reducing the negative impacts and ultimately keeping the receiving environment in its natural state. The management is achieved with adequate mitigation measures, per the applicable stormwater drainage standards and policies, to ensure the development can be accommodated within the receiving environment.

⁷ Guidelines for Human Settlement Planning and Design compiled by CSIR Building and Construction Technology

10.2 The Purpose of Stormwater Management⁸

The purpose of stormwater management is based on several aspects: health and safety, quality of life, and water conservation. These aspects are briefly described below:

- Directing and discharging the stormwater allows the public to protect their health, welfare, and safety. It also provides for the protection of property from flood hazards.
- Enhance the quality of life in communities that are affected.
- To grasp the opportunity to conserve water for beneficial public uses.
- To safeguard the natural environment.
- The balance of economic development and the necessity for a sustainable environment; and
- Optimum stormwater management methodologies are adopted so that the primary beneficiaries pay as per their possible gains.

10.3 Stormwater Management Policies & Design Guidelines

Urban Stormwater Management policies require that the post-development run-off from an area for storms of similar recurrence intervals may not exceed the run-off generated under the pre-development condition. For rural developments, the emphasis should focus more on the detrimental effect to the immediate environment concerning the control of water velocity and erosion rather than minor increases between the pre and post-development flow volumes.

This study area falls within Ditsobotla Local Municipality and greater Ngaka Modiri Molema District Municipality, and, to our knowledge, specific policies, design guidelines, and standards are not available. Therefore, we recommend that the stormwater drainage system refers to the "Red Book"⁹ and the "Drainage Manual"¹⁰.

10.4 Stormwater Management Philosophy

The Stormwater Management Philosophy for the proposed development urges the developer, the professional teams, and contractors to achieve the following:

- Always maintain adequate ground cover in all areas to reduce the risk of erosion by wind, water and all forms of traffic.
- Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion. Where unavoidable, adequate protection of the ground must be provided.
- Reduce concentrated stormwater flows as much as possible by providing effective attenuation measures.
- Ensure the development does not increase the stormwater flow rate above what the natural ground can safely accommodate.
- Ensure that all stormwater control structures are constructed safely and aesthetically pleasing in keeping with the overall development.
- Prevent pollution of waterways and water features.
- Contain soil erosion by constructing protective works to trap sediment at appropriate locations. This protection applies particularly during construction; and
- Avoid situations where natural or artificial slopes may become saturated and unstable during and after construction.

⁸ *Guidelines for Human Settlement Planning and Design compiled by CSIR Building and Construction Technology*

⁹ *Guidelines for Human Settlement Planning and Design compiled by CSIR Building and Construction Technology*

¹⁰ *Drainage Manual 6th Edition, Published by The South African National Roads Agency SOC Ltd, 2013*

10.5 Stormwater Management Drainage System

Today, stormwater drainage systems can be seen as dual systems incorporating minor and major systems.

The minor stormwater drainage system caters for frequent storm events. Storms of a minor nature usually include stormwater run-off with frequent return periods such as 2 yr, 5 yr & / or 10 years.

The major stormwater drainage system caters for severe, infrequent storm events and includes less frequent return periods such as 20 yr and more.

11. PRE-DEVELOPMENT RUN-OFF CHARACTERISTICS

11.1 Catchment Description

The development falls within two (2) main catchment areas that will affect the proposed development site. The catchment sizes are 20.105 km² and 25.953 km² and are approximately flat at < 1% slope. As mentioned above in **Section 9**, the catchments all fall within the C31A quaternary catchment. It shows no evidence of clearly defined watercourses. Overland sheet flow occurs in multiple directions through the respective catchments.

The land use is predominantly rural grasslands. Soils were classed under the SCS hydrological soil group C, with a moderately high stormflow potential (slow infiltration rates, shallow soil depths and restricted permeability).

The site is located safely away from any streams, rivers or floodplains and, therefore, will not be impacted by a flood line.

11.2 Site Topography

Both developments combined naturally and uniformly slope in one direction, namely south-east. As mentioned above, no defined drainage lines run through the proposed developments; however, larger drainage lines, namely the Harts River, can be found within the Quaternary catchment outside the proposed developable area, running through Lichtenburg. (Refer to **Figure 11:1** below).

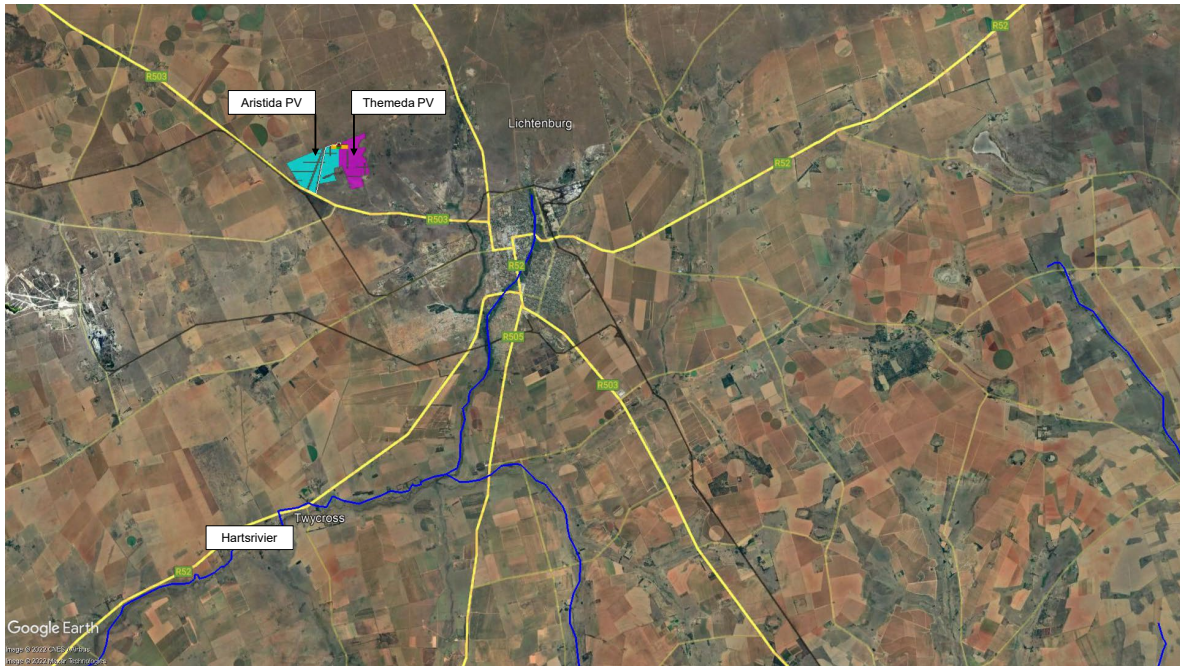


Figure 11:1 Larger Drainage Lines (Blue) outside the Site Parameters (Themeda PV in purple)

Please note that detailed contour data was not available for the broader study area. Therefore, the National Geo-Spatial Information (NGI) 's 25 m DEM was sourced to provide terrain data for this area.

Contours were generated from the Digital Elevation Model (DEM) at 2.5 m intervals using ESRI's 3D Analyst Extension for ArcGIS. Therefore, we recommend that an updated, detailed SWMP be completed once a more accurate Digital Terrain Model (DTM) of the site is available

From **Figure 11:3** below, we confirm a natural slope of $\pm 1:518$ or 0.193 % with the following percentages:

- Wetlands & Pans – 80 %
- Flat Areas (3 % to 10 % slope) – 20 %
- Hilly Areas (10 % to 30 % slope) – 0 %
- Steep Areas (> 30 % slope) – 0 %

11.3 Site Vegetation

We confirm that the majority of the site covering is made up of short to medium grass with scattered small shrubs and trees.



Figure 11:2 Themeda PV - Current Site Vegetation

Regarding **Figure 11:2** above, being the typical ground cover on the site, the following percentage splits are applicable: -

- Thick Bush & Plantations – 2.5 %
- Light Bush & Farmlands – 30 %
- Grasslands – 62.5 %
- No Vegetation – 5 %

11.4 Geotechnical Conditions

Concerning **Section 7 – Geotechnical Study** above, we have assumed the soil conditions to be as follows: -

- Very Permeable – 20 %
- Permeable – 70 %
- Semi-permeable – 0 %
- Impermeable – 10 %

11.5 Hardstand Areas

The property currently has no areas of hardstand: -

- Hardstand Areas – 0 %

11.6 Run-Off Coefficient

Based on *Table 3C.1* of the *Drainage Manual – 6th Edition*¹¹, the following run-off coefficients have been assigned for this calculation: -

Table 11:1 Pre-Development Run-Off Coefficient

UN-DEVELOPED COMPONENT: Run-off Percentages			
Surface Slope - Wetlands & Pans	0.03	80.0 %	0.024
Surface Slope - Flat Areas (3 % - 10 %)	0.08	20.0 %	0.016
Surface Slope - Hilly Areas (10 % - 30 %)	0.16	0.0 %	0.000
Surface Slope - Steep Areas (> 30 %)	0.26	0.0 %	0.000
<hr/>			
Soil - Very Permeable	0.04	20.0 %	0.008
Soil - Permeable	0.08	70.0 %	0.056
Soil – Semi-Permeable	0.16	0.0 %	0.000
Soil - Impermeable	0.28	10.0 %	0.026
<hr/>			
Vegetation - Thick Bush / Plantations	0.04	2.5 %	0.001
Vegetation - Light Bush / Farmlands	0.11	30.0 %	0.033
Vegetation - Grasslands	0.21	62.5 %	0.131
Vegetation - No Vegetation	0.28	5.0 %	0.014
			0.309

Based on the preceding, we calculated a **PRE-DEVELOPMENT Run-Off Coefficient** of **0.309**.

It should also be noted that no 'Area Reduction Factor' has been applied as we believe the drainage catchment areas are too small.

¹¹ *Drainage Manual 6th Edition, Published by The South African National Roads Agency SOC Ltd, 2013*

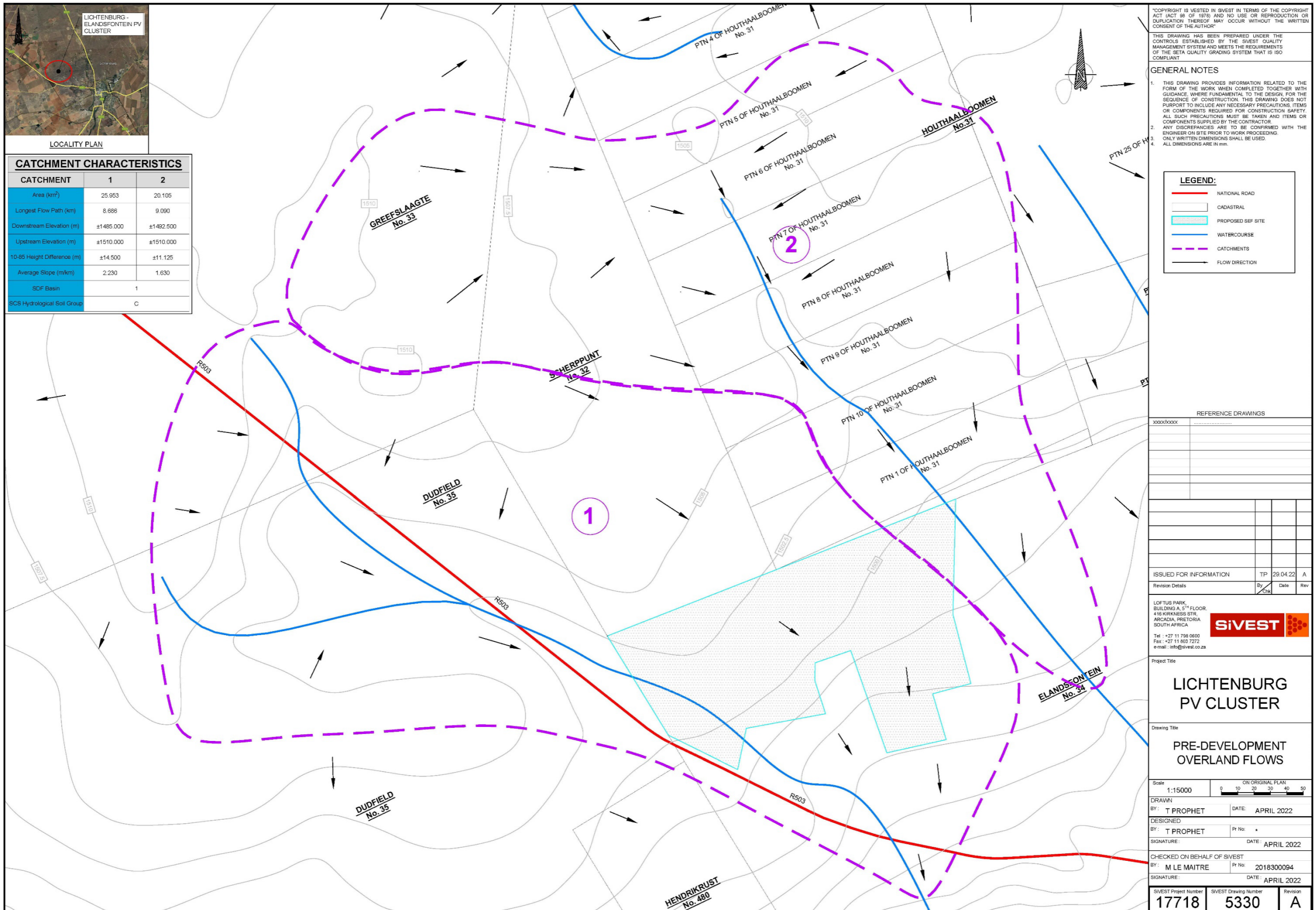


Figure 11:3 Themeda PV Development Area- Pre-Development Overland Flow

12. POST-DEVELOPMENT RUN-OFF CHARACTERISTICS

12.1 Site Development Plan (SDP)

Concerning the SDP, we confirm this proposed PV Plant layout will consist of a series of PV Panels in a structured pattern along with an access road, internal roads, substation, battery energy storage system (BESS), laydown areas, auxiliary buildings, and external access roads etc. The total development area envisaged for the greater Elandsfontein Cluster will cover a combined area of ± 440 ha, whereas Themeda PV will only cover ± 189 ha.

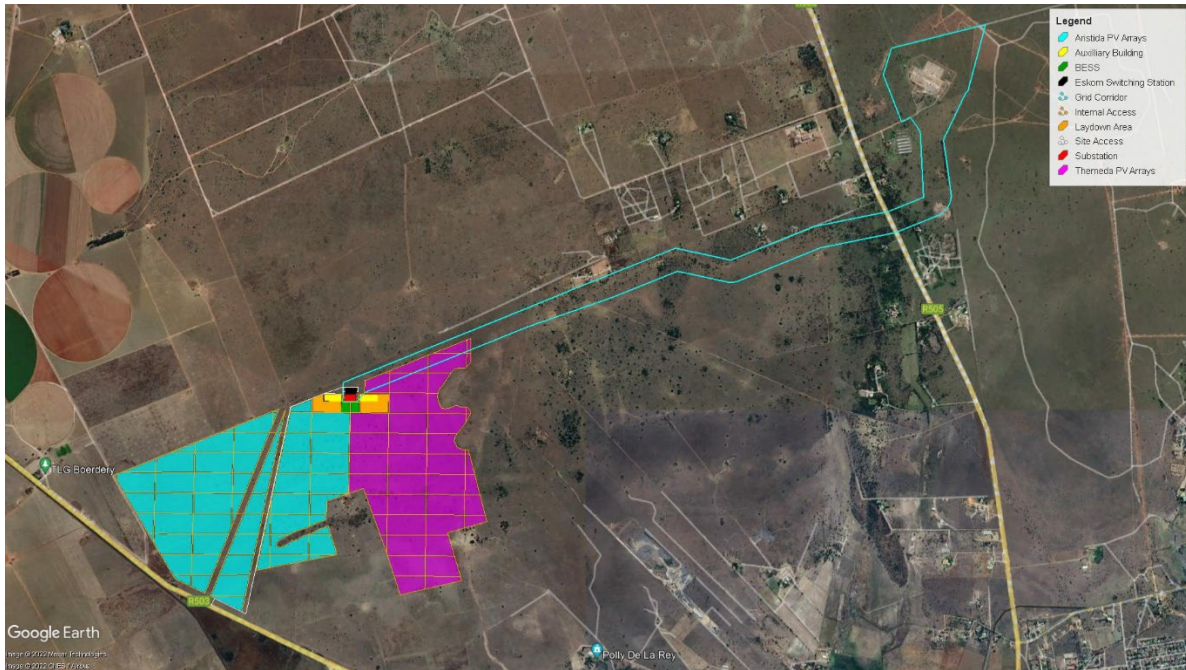


Figure 12:1 Themeda PV SDP (Indicated in purple)

12.2 Site Vegetation

The intention is to clear the site void of large bushes and shrubs and to rejuvenate the area over time to its original state in **Figure 11:2** above.

The following percentage splits are applicable: -

- Thick Bush & Plantations – 2.5 %
- Light Bush & Farmlands – 30 %
- Grasslands – 62.5 %
- No Vegetation – 2.5 %

12.3 Geotechnical Conditions

Concerning **Section 7 – Geotechnical Study**, we have assumed the percentages used in the 'pre-development' run-off coefficient to remain unchanged for the 'post-development' as there would be little or no effect from the facility on the existing ground conditions.

The following percentages will be used: -

- Very Permeable – 20 %
- Permeable – 70 %
- Semi-permeable – 0 %

- Impermeable – 10 %

12.4 Developed Components

Once developed, we confirm that the property will have no significant impervious surfaces in the form of surfaced roads or surface covering other than the natural ground cover. However, gravel roads will be constructed across the site to provide access to the PV panels for maintenance purposes. Gravel roads will have frequent discharge points to reduce stormwater concentrations and ultimately minimise the development impact.

We have therefore assumed a slight increase in the area of imperviousness.

- Gravel Roads – 2 %
- PV Facility – 93 %
- Grasslands – 0 %
- No Vegetation – 5 %

12.5 Run-Off Coefficient

Based on *Table 3C.1* of the *Drainage Manual – 6th Edition*¹², the following run-off coefficients percentages have been assigned for this calculation: -

Table 12:1 Post-Development Run-Off Coefficient

UN-DEVELOPED COMPONENT: Run-off Percentages			
Surface Slope - Wetlands & Pans	0.03	80.0 %	0.024
Surface Slope - Flat Areas (3 % - 10 %)	0.08	20.0 %	0.016
Surface Slope - Hilly Areas (10 % - 30 %)	0.16	0.0 %	0.000
Surface Slope - Steep Areas (> 30 %)	0.26	0.0 %	0.000
<hr/>			
Soil - Very Permeable	0.04	20.0 %	0.008
Soil - Permeable	0.08	70.0 %	0.056
Soil – Semi-Permeable	0.16	0.0 %	0.000
Soil - Impermeable	0.28	10.0 %	0.026
<hr/>			
Vegetation - Thick Bush / Plantations	0.04	2.5 %	0.001
Vegetation - Light Bush / Farmlands	0.11	30.0 %	0.033
Vegetation - Grasslands	0.21	62.5 %	0.131
Vegetation - No Vegetation	0.28	5.0 %	0.014
			0.309
DEVELOPED COMPONENT: Run-off Percentages			
Surface Slope - Wetlands & Pans	0.03	80.0 %	0.024
Surface Slope - Flat Areas (3 % - 10 %)	0.08	20.0 %	0.016
Surface Slope - Hilly Areas (10 % - 30 %)	0.16	0.0 %	0.000
Surface Slope - Steep Areas (> 30 %)	0.26	0.0 %	0.000
<hr/>			
Soil - Very Permeable	0.04	20.0 %	0.008
Soil - Permeable	0.08	70.0 %	0.056
Soil – Semi-Permeable	0.16	0.0 %	0.000
Soil - Impermeable	0.28	10.0 %	0.026
<hr/>			
Gravel Roads	0.50	2.0 %	0.010
PV Facility	0.22	93.0 %	0.205

¹² *Drainage Manual 6th Edition, Published by The South African National Roads Agency SOC Ltd, 2013*

Vegetation - Grass	0.21	0.0 %	0.000					
Vegetation - No Vegetation	0.28	5.0 %	0.014					
			0.359					
RUN-OFF COEFFICIENT: WITH DOLOMITE								
Description	%	Q2	Q5	Q10	Q25	Q50	Q100	Q200
UN-DEVELOPED	92.0	0.128	0.141	0.154	0.172	0.213	0.257	0.285
DEVELOPED	8.0	0.029	0.029	0.029	0.029	0.029	0.029	0.029
TOTAL Run-Off Coefficient		0.157	0.170	0.183	0.201	0.242	0.285	0.313

Based on the preceding, we calculated a **POST-DEVELOPMENT Run-Off Coefficient** for the development area for the following return periods;

- Q2 - 0.157
- Q5 - 0.170
- Q10 - 0.183
- Q25 - 0.201
- Q50 - 0.242
- Q100 - 0.285
- Q200 - 0.313

The above coefficients were then factored into the existing catchments with the appropriate **POST-DEVELOPMENT Run-Off Coefficients** for each return period used in the modelling below.

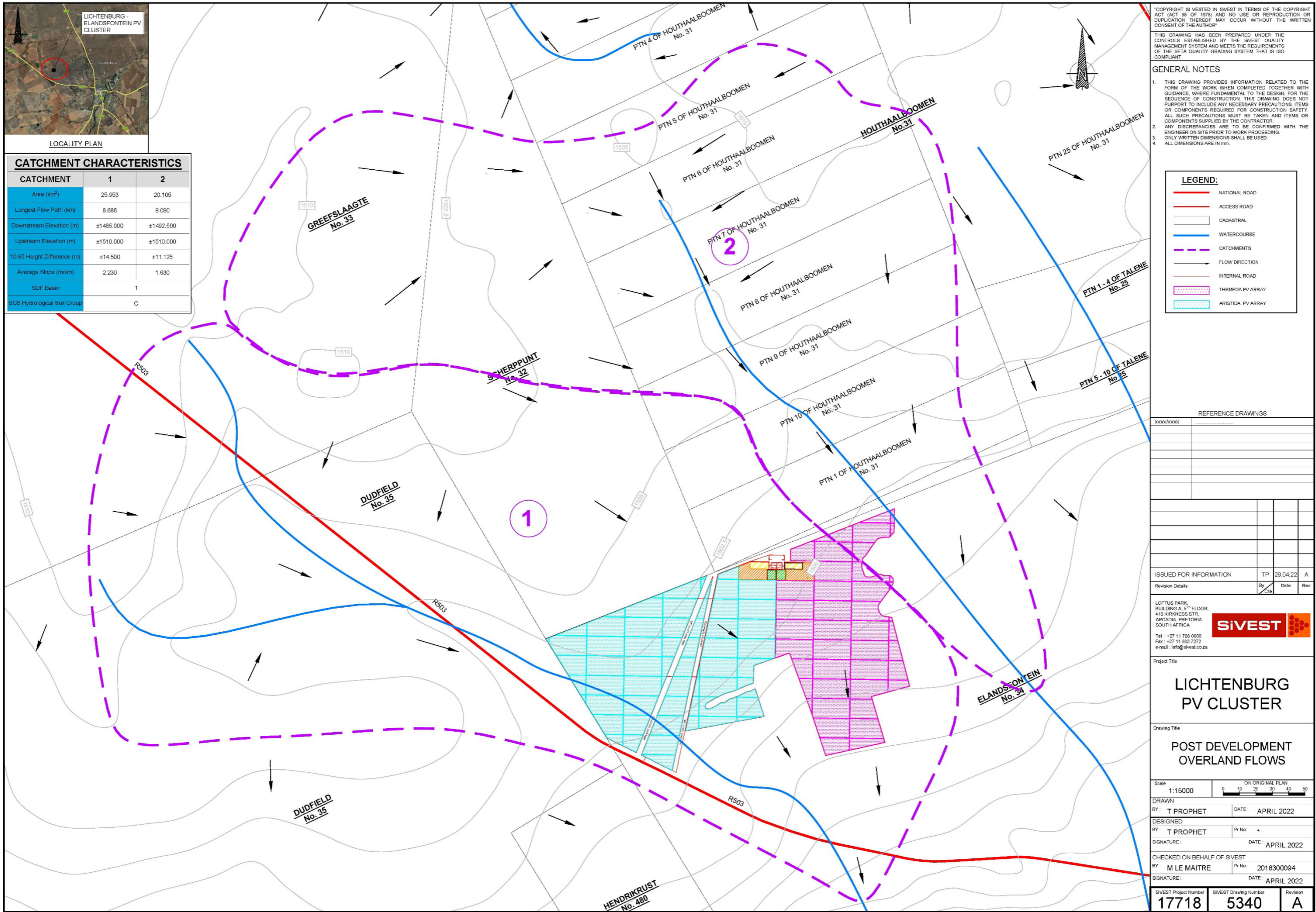


Figure 12:2 Themeda PV (Indicated in cyan above) – Post-Development Overland Flow

13. SURFACE MODELLING

13.1 Modelling Selection

EMPIRICAL and STATISTICAL METHODS were not considered for this project as insufficient hydrological records and observed points were available for the area. Therefore, a deterministic method has thus been selected to determine the results.

This method comprises mainly manual, graphic and computer-generated spreadsheets. Therefore, we believe our selection of the 'UNIT HYDROGRAPH METHOD' (HRU 1972) and the 'RATIONAL METHOD' is appropriate because the site does not have a varying degree of post-development land change and does not have any existing permanent dams and sub-catchments. Computerised spreadsheets have been used to assist with iterations and to eliminate manual calculation errors.

As noted in **Section 11**, the proposed site is affected by two (2) main catchments: Catchments No. 1 & 2. **Section 13.2** below modelled the surface run-off for each catchment for Pre and Post-Development conditions.

13.2 Surface Run-Off Modelling Results

13.1.2 CATCHMENT N° 1

Table 13:1 Pre-Development Modelling Results

Return Storm Period	Unit Hydrograph Method	Rational Method 'Kerby'	Rational Method 'Empirical'	SDF Method	SCS Method
	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)
1: 2 year	3.41	6.19	9.56	14.00	18.54
1: 5 year	17.12	12.26	17.74	30.80	33.02
1: 10 year	24.43	18.59	25.31	47.35	44.03
1: 25 year	35.77	28.82	37.06	63.88	55.73
1: 50 year	52.27	44.45	54.15	85.66	72.00
1: 100 year	72.68	64.95	75.18	108.48	85.13

Table 13:2 Post-Development Modelling Results

Return Storm Period	Unit Hydrograph Method	Rational Method 'Kerby'	Rational Method 'Empirical'	SDF Method	SCS Method
	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)
1 : 2 year	3.84	6.97	10.76	14.00	18.54
1 : 5 year	18.95	13.57	19.63	30.80	33.02
1 : 10 year	26.66	20.28	27.62	47.35	44.03
1 : 25 year	38.40	30.93	39.78	63.88	55.73
1 : 50 year	54.57	46.40	56.53	85.66	72.00
1 : 100 year	74.34	66.43	76.89	108.48	85.13

13.2.2 CATCHMENT N° 2

Table 13:3 Pre-Development Modelling Results

Return Storm Period	Unit Hydrograph Method	Rational Method 'Kerby'	Rational Method 'Empirical'	SDF Method	SCS Method
	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)
1 : 2 year	2.39	4.45	6.54	9.76	13.92
1 : 5 year	12.28	8.80	12.14	21.48	24.79
1 : 10 year	17.52	13.35	17.32	33.01	33.06
1 : 25 year	25.65	20.70	25.37	44.55	41.84
1 : 50 year	37.49	31.92	37.07	59.73	54.06
1 : 100 year	52.37	46.65	51.46	75.64	63.92

Table 13:4 Post-Development Modelling Results

Return Storm Period	Unit Hydrograph Method	Rational Method 'Kerby'	Rational Method 'Empirical'	SDF Method	SCS Method
	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)	(m ³ / s)
1 : 2 year	2.69	5.01	7.36	9.76	13.92
1 : 5 year	13.59	9.75	13.44	21.48	24.79
1 : 10 year	19.12	14.57	18.91	33.01	33.06
1 : 25 year	27.54	22.22	27.23	44.55	41.84
1 : 50 year	39.13	33.32	38.70	59.73	54.06
1 : 100 year	53.57	47.71	52.64	75.64	63.92

The results above indicate the proposed development will have a minor increase between the Pre and Post-Development flows. Therefore, we believe implementing adequate stormwater management guidelines can accommodate the proposed development without negatively impacting the downstream catchment.

14. STORMWATER MANAGEMENT & GUIDELINES

The buildings / structures within the development will require the control of stormwater run-off as per the stormwater management philosophy and policies of the local authority / municipality. The following guidelines are intended to assist in the design of the major and minor stormwater infrastructure and to ensure that the objectives of this SWMP are met during the planning, design, construction, and operational phases of the development.

14.1 Buildings

Any building will inevitably result in some degree of flow concentration or deflection around buildings. The developer / owner shall ensure that all stormwater flow paths are protected against erosion.

Any inlet to a piped system shall be fitted with a screen / grating to prevent debris and refuse from entering the stormwater system. This must be installed immediately on the installation of the infrastructure. The onus is on the owner / developer to maintain the state of the screen / grating to ensure smooth flow.

No building works, earthworks, walls or fences may obstruct or encroach on a watercourse inside or outside the site without approved plans that do not compromise the objectives of the SWMP in addition to any required Authority approvals.

14.2 Roof Drainage

Building designs must ensure that rainfall run-off from roofing and other areas, not subjected to excessive pollution, can be efficiently captured for re-use for on-site irrigation and non-potable water uses.

Where storage for re-use and ground conditions permit, rainwater run-off should connect to detention areas to maximise groundwater recharge. These detention areas must be designed to attenuate run-off, specifically, the peak flows experienced in the reaches of a watercourse.

14.3 Parking and Paved Areas

Parking or paved areas should be designed to attenuate stormwater run-off to an acceptable degree by allowing ponding or infiltration. Stormwater from such areas must be discharged and controlled as overland sheet flow or larger attenuation facilities.

14.4 Roads

Roads should be designed and graded to avoid the concentration of flow along and off the road. Regular side drains discharge points along roads for overland flow to continue as sheet flow towards drainage lines per pre-development conditions (Refer to **Figure 14:1**). Where flow concentration is unavoidable, measures to incorporate the road into the major stormwater system should be taken, providing appropriately designed attenuation storage facilities at suitable points.

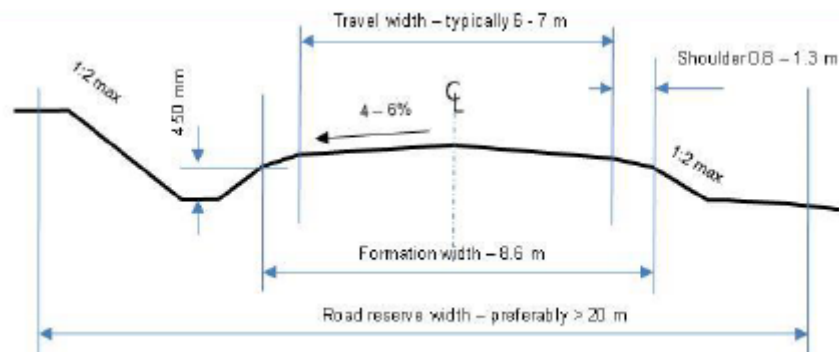


Figure 14:1 Typical Road Cross Section showing side drains

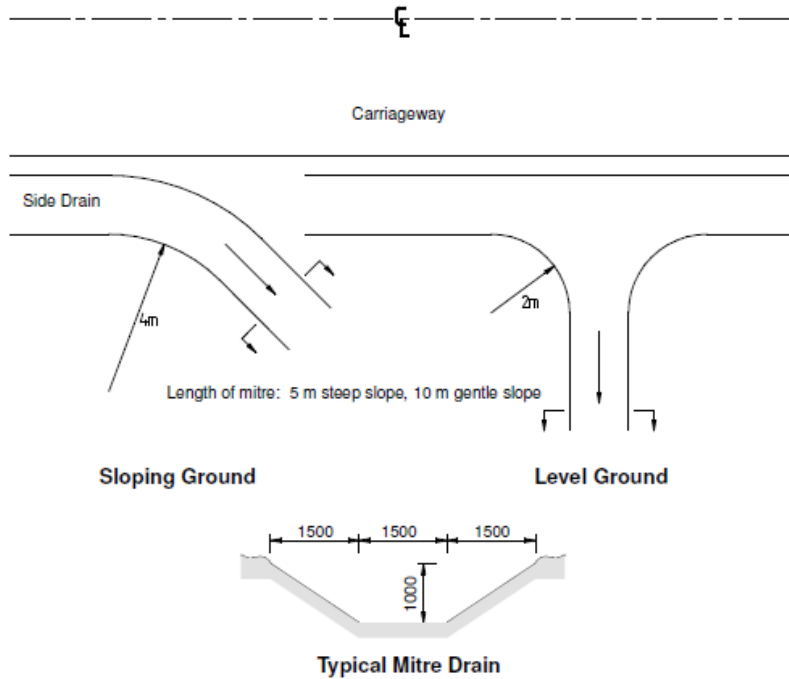


Figure 14:2 Typical Stormwater Mitre Drain / Channel

Gravel roads crossing drainage lines require a suitable sized culvert, concrete causeways or cut-off walls to ensure vehicles can safely pass over natural drainage lines. Culverts for roads must be designed to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point, and attenuation storage should be provided on the upstream side of the road crossing.

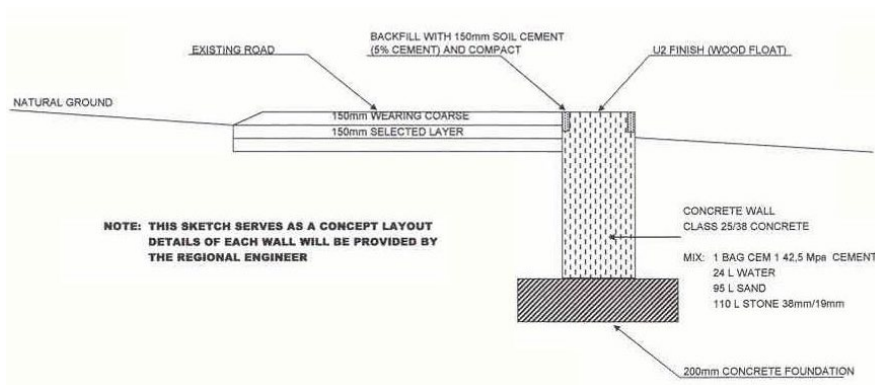


Figure 14:3 Typical Detail of a Cut-Off wall



Figure 14:4 Typical Low-Level Concrete structure

Outlet and culvert discharge points into the natural watercourse must be designed to dissipate flow energy, and any unlined downstream channel must be adequately protected against soil erosion. (Refer to **Figure 14:5**)

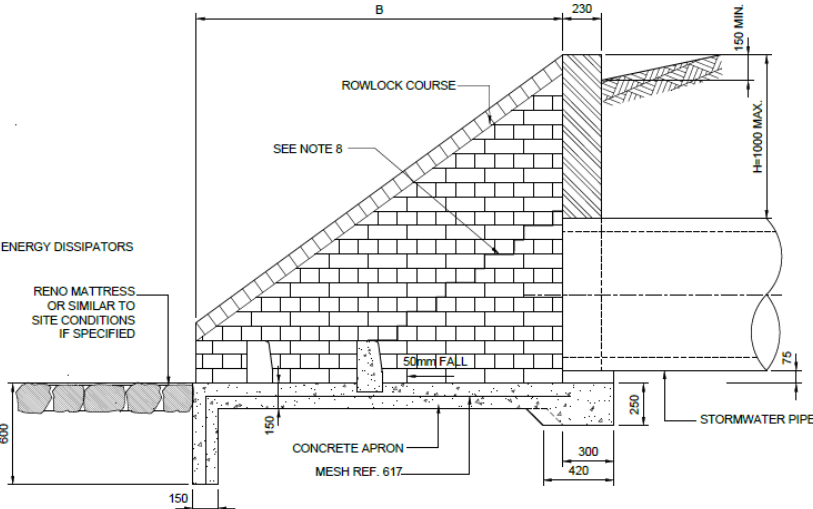


Figure 14:5 Typical Stormwater Headwall with Energy Dissipators

14.5 Subsurface Disposal of Stormwater

Any construction providing for the subsurface disposal of stormwater should be designed to ensure that such disposal does not cause slope instability or areas of concentrated saturation or inundation. Infiltration structures should be integrated into the terrain to be unobtrusive and in keeping with the natural surroundings.

14.6 Channels

Channels may be constructed to convey stormwater directly to a natural watercourse where deemed necessary and unavoidable. The channels must be suitably lined to prevent erosion and scour and provide maximum possible energy dissipation of the flow. Such linings will vary from vegetated earthen to stone pitching or reinforced concrete.

14.7 Energy Dissipation

Measures should be taken to dissipate flow energy wherever concentrated stormwater flow is discharged onto the natural ground.

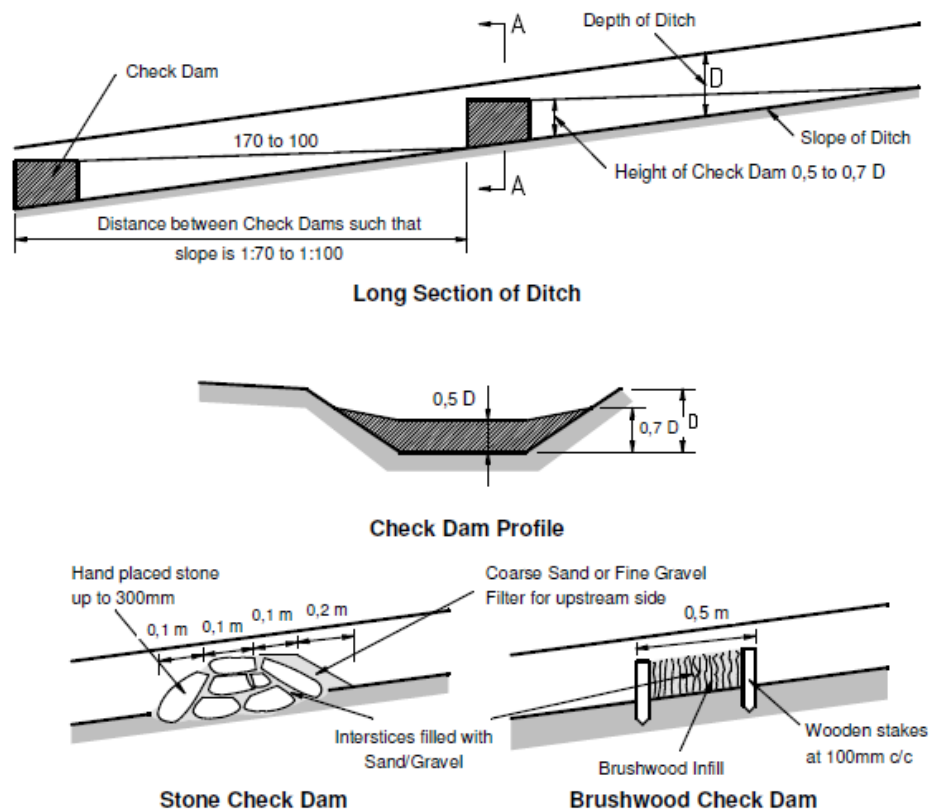


Figure 14:6 Typical Erosion Control

14.8 Open Trenches

Open trenches should not be left open and unprotected for extended periods and should be progressively backfilled as construction proceeds. Excavated material to be used as a backfill must be placed close to the trench on the upstream side to avoid loose material from washing away.

14.9 Stockpiles

Material is to be stockpiled away from drainage paths. Loose material such as stone, sand or gravel must be covered or kept damp to minimise dust. Temporary silt screens are to be positioned immediately downstream of stockpiles to intercept loose material which may be washed away.

14.10 Photovoltaic Panels

For the orientation of panels, we recommend the drainage pattern, flow concentration, drainage area and velocities be considered at the detail design stage. Rows perpendicular to the contours may result in higher run-off concentrations; therefore, mitigation measures are to be included to optimise orientation and keep the run-off as sheet flow across the entire site.

PV panels shall be designed and constructed in such a manner to allow for vegetative growth and maintenance beneath and between the panels. Although not applicable to this development, if any of the PV modules / strings are greater than 3 m high, from the lowest vertical clearance of the panels to

above the ground. In that case, non-vegetative control measures will be required to prevent / control erosion and scour along the drip line or otherwise provide energy dissipation from the water running off the panels.

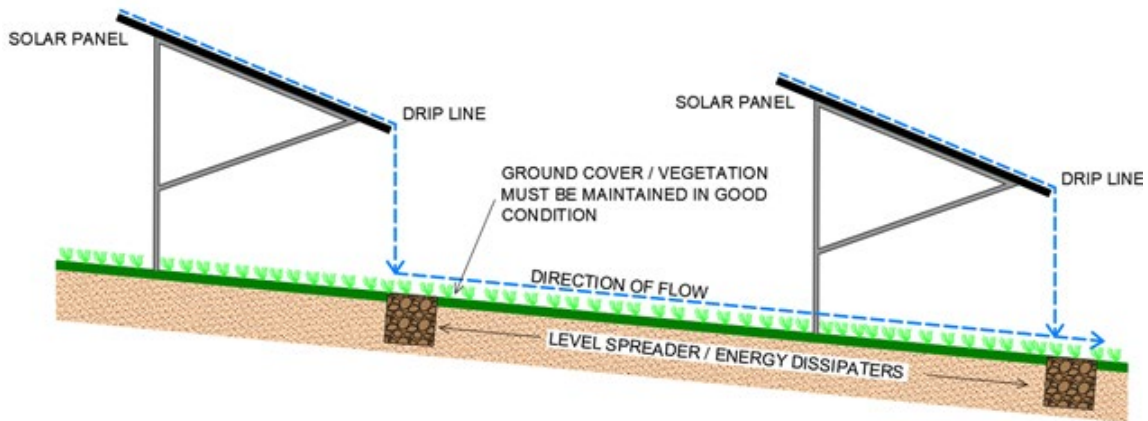


Figure 14:7 Stormwater control of Fixed Tilt PV showing drip line (Conceptual)

14.11 Stormwater Pollution Control

The stormwater systems should be free from materials that could harm the water systems' fauna, flora, and aquatic life.

Sites which generate "dirty" (Grey or Black) water must have measures in place that separates the clean and "dirty" water. Depending on the nature of the "dirty" water, the water must either be discharged into the wastewater system or contained on-site for off-site treatment.

15. STORMWATER MANAGEMENT POLICY

The following rules are to be observed by the owner, developer, professional team, contractors, and sub-contractors:

- The Environmental Management Program (EMPr), as per the EIA and approved by the competent authority, will manage stormwater run-off during construction. All construction activities within the development must comply with the EMPr. This SWMP document is supplementary to the EMPr. The control measures herein are not considered all-encompassing as the contractor will have to adapt site-specific control measures.
- Before the commencement of any construction activities, the contractor must compile and submit his construction SWMP, which needs to comply with the approved EMPr. The plan must include measures to control and prevent erosion during and after construction.
- Existing flood lines / wetlands / stormwater attenuation areas should be protected from encroachment by the development.
- Development designs must include measures for attenuating the increased concentration of stormwater run-off. The post-development peak flows can be attenuated to pre-development conditions if adequate stormwater mitigation measures are not implemented.
- On-site stormwater control systems, such as swales, berms and attenuation ponds, must be constructed before any other construction commences. These systems are to be monitored and appropriately adjusted as construction progresses to ensure complete stormwater, erosion and pollution control.
- All formed embankments must be adequately stabilised.
- This development is located in an area where dolomite is present, and therefore NO stormwater must be allowed to pond for extended periods.

- An approved landscaping and re-vegetation plan must be implemented immediately after building works have reached a stage where newly established ground cover is not at risk from the construction works.
- The contractor must show that all the provisions, regulations and guidelines in this document have been considered.
- In the event of a failure to adequately implement the approved SCP, the contractor shall be responsible for all consequential damage at his own cost. The developer is therefore advised to ensure that all members of the professional team and contractors are competent to undertake the development work and are adequately insured.
- Appropriate designed dolomitic attenuation / detention facilities will be located at appropriately selected sites based on geotechnical, environmental and topographical conditions, including wetland conservation.
- Where conditions permit, open ditches, drains and channels will be used instead of pipes. On steeper slopes, where high flow velocities are anticipated, appropriate linings for all channels must be provided to withstand erosion. Such linings will vary from vegetated earthen to stone pitching and reinforced concrete.
- Flow velocities must be reduced wherever possible to reduce the erosion potential in channels and points of flow concentration (typically at outlets).
- Silt, trash and oil traps must be strategically provided to ensure water quality is not compromised and to prevent blockages in the drainage systems.
- Areas within the proposed development that are bound on stormwater attenuation areas, near road crossings, watercourse confluences and water features might be subject to flooding. In these situations, all development should take place above the outfall levels with an appropriate freeboard allowance.
- Potential future development in these sub-catchments should be considered and any stormwater attenuation requirements should be identified for areas flowing into the development area. Likewise, consideration must be given to the stormwater flowing out of the development, which may impact the downstream areas and watercourses. Appropriate measures must be taken to ensure any upstream development does not result in an increased flood damage risk downstream; and
- All-natural and unlined channels should be inspected for adequate binding of soil by sustainable ground cover. Stone pitching should be used to reinforce channel inverters on steep slopes.

16. CONCLUSION & IMPACT STATEMENT

- In conclusion;
 - The Surface Modelling (**Section 13**) reveals that the proposed development / infrastructure will have a minimal impact on the stormwater quality and quantities of post-development stormwater flow (operational phase).
 - The highest impact will, in all likelihood, occur during the construction phase, and these impacts must be strictly managed under the advisement of the guidelines set out in this document.
 - The need for formal stormwater interventions can be minimised if the development is designed to maintain the existing drainage patterns. Overland flow via poorly defined drainage paths will be the primary form of conveyance.
 - The Civil Engineers must prepare a detailed stormwater management plan describing and illustrating the proposed stormwater and erosion control measures during the detailed design phase.
 - A comprehensive geotechnical study is completed before the detailed design stage of this development.
 - The guidelines described in **Section 14 – STORMWATER MANAGEMENT & GUIDELINES** should be incorporated into the detailed design of the development.

- The policy described in **Section 15 – STORMWATER MANAGEMENT POLICY** be implemented.
- Impact Statement;
 - Concerning this report, associated assessment and the findings made within, it is SiVEST's opinion that the Themeda PV and associated grid infrastructure will have a nominal impact on the existing stormwater catchment. The project is therefore deemed acceptable from a stormwater perspective, provided the recommendations and mitigation measures in this report are implemented. Hence, Environmental Authorisations (EA) should be granted for the EIA application.
 - This document should also be read in conjunction with the EMPr. The developer, owner, and professional team shall ensure that the requirements and conditions set out in the EMPr are adhered to.

17. REFERENCES

Climate Data for Cities Worldwide (Lichtenburg) - www.en.climate-data.org

Council for Scientific and Industrial Research (CSIR) - *Guidelines for Human Settlement Planning and Design compiled by CSIR Building and Construction Technology (2003)*

Lauren M. Cook and Richard H. McCuen – *Hydrologic Response of Solar Farms (May 2013)*

MJ Gorven, JC Smithers and RE Schulze - *Design Rainfall Estimation in South Africa (Version 3)*

South African National Roads Agency – *Drainage Manual 6th Edition (2013)*

Van Der Walt, J – *Heritage Baseline Report: For the Elandsfontein PV Cluster (Themeda PV and Aristida PV), Lichtenburg, North-West Province. Beyond Heritage (2022)*

Weather Atlas (Lichtenburg) – www.weather-atlas.com

Western Cape Provincial Administration – *Gravel Roads Manual Rev 0*

APPENDIX A: SPECIALIST CURRICULUM VITAE

CURRICULUM VITAE

Merchandt Le Maitre

Name	Merchandt Le Maitre
Profession	Civil Engineer
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Divisional Manager: Civil Engineering Division
Years with Firm	17 Years
Date of Birth	25 September 1982, Johannesburg, South Africa
ID Number	820925 5037 086
Nationality	South African



Education

- University of Johannesburg (2006)
- University of South Africa (2016)

Professional Qualifications

- N Dip: Civil Engineering
- B Tech: Civil Engineering (Water)
- Pr.Tech.Eng. (Reg. No. 2018300094)

Membership in Professional Societies

- Engineering Council of South Africa (ECSA) – Pr Tech Eng; (Reg N° 2018300094)
- South African Institute of Civil Engineers (SAICE)
- South African Wind Energy Associations (SAWEA)

Employment Record

Nov 2020 – present	SiVEST SA (PTY) LTD: Divisional Manager
May 2004 – Oct 2020	SiVEST SA (PTY) LTD: Senior Civil Engineering Technician
Jan 2004 – April 2004	Con Roux Zambia - Junior Foreman
Dec 2002 – Dec 2003	Neda Engineering - Vacation Work

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Fluent	Fluent	Fluent

Years of Working Experience: 17

Countries of Work Experience

- South Africa
- Swaziland
- Zambia
- Kenya
- Namibia

Fields of Expertise

- Bulk Services Studies
- Feasibility Studies
- Service Reports
- Infrastructure Design
- Contract Documentation & Procurement
- Contract Administration
- Procurement and Construction Monitoring

Overview

Merchandt joined SiVEST as a student Civil Engineering Technician in 2004 to which he received a company bursary to complete his studies and join the company permanently thereafter. Since joining permanently he has been actively involved in numerous township projects and associated infrastructure projects.

A summary of the experience in each field is indicated below:

Roads & Stormwater

Design, Implement & Contract Administration:

- Provincial Road Intersections (Class 2 Roads)
- Municipal Roads (Class 3-5 Roads)
- Residential & Industrial Township services
- Bulk Stormwater Infrastructure

Hydrology

- Attenuation Reports
- Flood Inundation Assessments / Floodline Reports
- Stormwater Management Reports
- Stormwater Assessments / Investigations
- Roof Gutter & Down Pipe Design / Assessments / Reports

Water & Sanitation

Design, Implement & Contract Administration:

- Water supply lines including Bulk Water
- Water pump stations
- Sanitation networks including Outfall Sewers
- Sewer pump stations
- Farm Irrigation Network

Renewable Energy

- Transportation Impact Assessments
- Water Demand Assessments
- Glint & Glare Assessments
- Stormwater Management Reports

- Preliminary Engineering Reports & Designs

Projects Experience (by Sector)

TOWNSHIP SERVICES

- Tijger Valley Extension 10, 20, 21, 22, 23, 27, 38-44, 72, 105-113, 19, 62, 103, 104, 34, 35, 36, 123 etc. - Design, Procurement, Contract Administration and Monitoring.
- Derdepoort Extension 181- Design, Procurement, Contract Administration and Monitoring.
- Project Springbok, Sasolburg - Design, Procurement, Contract Administration and Monitoring.
- Arcadia Extension 11 - Design, Procurement, Contract Administration and Monitoring.
- Lakeside Erf 181- Design, Procurement, Contract Administration and Monitoring.
- Longmeadow Extension 10, 11 & 12 - Design, Procurement, Contract Administration and Monitoring.
- Bushwillow Estate - Design, Procurement, Contract Administration and Monitoring.
- Forum Homini – Draughting Monitoring of Dam Spillway construction & sewer reticulation.
- Longmeadow Extension 7, 8, 9, 10, 11, 12 – Township services and design of earth retaining wall.
- Lakeside Erf 181 – Design and supervision of Township Services including Attenuation facilities.
- Mbabane Kingdom Hall – Bulk earthworks and road Design, Procurement, Contract Administration and Monitoring.
- Kungwini Bulk Water – Draughting and supervision of a Steel Bulk Water Supply Pipe.
- Mooikloof Booster Station – Design and supervision of a water booster pump facility..
- PTN 2 of 148 Athol – Compiling and analysis Stormwater Assessment.
- Mooibosch Development – Compiling of Services reports and Floodline Determination.
- Hazeldean Extension 39 – Design and supervision of Township Services.
- Hazeldean Retirement – Design of Township Services.
- Kungwini Collector Sewer – Design of Collector Sewer.
- Maroeladal Extension 9 – Design and compilation of Services Report.
- Hazeldean Oukraal – Design of Township Services
- Hazeldean Business Park – Design and compilation of Services Reports.
- Erf 181 Derdepoort – Design and compilation of Services Reports and preliminary design of Provincial Intersection.
- Erf 92 Edenburg – Floodline Determination and design and compilation of the Services reports.
- Longmeadow Extension 12 Stormwater – Design of Stormwater Reticulation.
- Astral Foods - Design, Procurement, Contract Administration and Monitoring of civil services.
- Eastgate Solar Roof – Glint & Glare Assessment
- Cotton Gin Mpumalanga – Design & Procure all services

ROADS & INTERSECTION DESIGN

- D631 Intersection – Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- D36 Intersection & Road Widening - Design, Wayleave Approval, Procurement.
- K34 Intersection – Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- K101 Intersection – Design, Wayleave Approval.
- Justice Mahomed, University, Walton Jameson Rd Intersection – Design, Wayleave Approval.
- Cedar Road West – Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- Brikor – Design of New Intersection.
- New Zealand Embassy – Design of Intersection.
- East Point Game - Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.

HYDROLOGY AND STORMWATER

- Hazeldean Floodline - Data collection, Flood determination and compilation.

CURRICULUM VITAE

Merchandt Le Maitre

- Gautrain Railway Stormwater Management – Design and compile stormwater management and attenuation facilities.
- Stormwater Modelling for Project Springbok – Attenuation of hazardous material in stormwater system.
- Sappi Ngodwana Floodline – Data collection, Flood determination and compilation. This floodline included cognisance of the Ngodwana dam.
- Irene Mall Stormwater Management - Accommodation of the Post Development stormwater flow through an existing township / suburb.
- Loftus Park Stormwater Management – Accommodation of the Post Development stormwater flow through an existing township / suburb.
- Pienaars River Floodline Modelling – Modelling of the river through two future Class 1 & 3 road bridge structures.
- Renewable Energy Stormwater Management – A number of Management Plans for the Renewable Energy sector has been completed.
- Longmeadow Extension 10 (Pick & Pay) – Design and compilation of Stormwater Management report.
- Erf 4173 Peter Place – Floodline Determination.
- Irene Mall Township – Design of Township Services and Stormwater Management.
- Mitsubishi McCarthy Midrand – Design and compilation of Stormwater Management report.
- Isago @ N12 – Floodline Determination.
- Innoland – Floodline Determination.
- Lot 204 Edenburg – Floodline Determination
- Erf 90 Douglasdale – Floodline Determination.
- PTN 35 Houtkoppen – Floodline Determination.
- Erf 4173 Peter Place – Floodline Determination.
- Hyde Close Floodline – Floodline Determination.
- Chartwell Floodline – Floodline Determination
- Hyundai East Rand – Roof Gutter & Down Pipe design
- Oilifants River – Floodline Determination

WATER TRANSFER / RETICULATION AND SANITATION COLLECTORS / OUTFALLS

- Bojanala Platinum District Municipality – Water & Sanitation Bulk Master Planning.
- Hazeldean Development – Bulk Water Supply & Collector Sewer Design, Procurement, Contract Administration and Monitoring.
- Mamba Kingdom – Bulk Water Analysis.
- Lesedi Local Municipality Bulk Water - Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- NEF Tomato Paste Project – Design of Farm Irrigation Network

RENEWABLE ENERGY

- Dyansons Klip 5 – Stormwater Management Report
- De Aar Solar – Stormwater Management Report
- Droogfontein Solar – Stormwater Management Report
- Mierdam Solar – Stormwater Management Report
- Prieska– Stormwater Management Report
- Hoekplaas – Stormwater Management Report
- Noupoort WEF – Stormwater Management Report
- Copperton PV – Stormwater Management Report
- Klipgats PV – Stormwater Management Report
- Tooverberg Wind Energy Facility – Transportation Impact Assessment & Water Demand Assessment
- Umsobomvu Solar Energy - Transportation Impact Assessment
- Prieska Solar Energy - Transportation Impact Assessment Amendment
- Droogfontein Solar Energy - Transportation Impact Assessment Amendment

CURRICULUM VITAE

Merchandt Le Maitre

- Loeriesfontein Solar Energy - Transportation Impact Assessment Amendment
- Koeris WEF - Transportation Impact Assessment Amendment
- East Gate Shopping Centre - Glint & Glare Assessment
- Oya Energy - Glint & Glare Assessment
- Yemaya – Glint & Glare Assessment
- Beaufort West WEF – Preliminary Engineering Design
- Heuweltjies WEF – Transportation Study
- Kraaltjies WEF – Transportation Study
- Koup 1 & 2 – Transportation Study
- Grootegeluk Solar Project – Transportation Study
- Renewstable Swakopmund – Glint & Glare Assessment
- Several projects are Confidential as they are not yet in the public domain and hence have not been included in the list above.

OTHER

- Project Springbok – Design of Services and Railway Siding.
- Phalaborwa Mining Company – Preliminary Design of Bulk Water feed and Railway Line.
- Kansanshi Copper Mine, Zambia – Junior Site Foreman.
- Final QC for Sasol Secunda.
- NDT testing – MMC Nelspruit, Global Forest Products Sabie.
- Boiler inspections and preliminary design – MMC Nelspruit, Global Forest Products, TSB Malelane.

Computer Skills

- AutoCAD Civil 3D
- AutoCAD Storm and Sanitary Analysis
- Microsoft Office
- Microsoft Project
- TechnoCAD
 - Surfmate
 - Roadmate
 - Pipemate
 - Watermate
- AutoTURN (Vehicle Turning Simulation Software)
- RiverCAD
- HecRAS
 - 1D Flood Modelling
 - 2D Flood Modelling

A handwritten signature in black ink, appearing to read "W. Maitre".



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THEMEDA PV (PTY) LTD

THEMEDA PV

Transportation Study

Issue Date: 5th August 2022
Revision No: 1
Project No: 17718
Document No: TS_T

Date:	5 th August 2022	
Document Title:	Themeda PV Transportation Study	
Revision Number:	1	
Author:	Merchandt Le Maitre (Pr. Tech Eng.)	
Signature:	 Pr. N°: 2018300094	Date: 5 th August 2022
Reviewed:	Richard Hirst (Pr Tech Eng.)	
Signature:	 Pr. N°: 2018300110	Date: 5 th August 2022
For:	THEMEDA PV (PTY) LTD	
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EXECUTIVE SUMMARY

Objective

The Applicant, Themeda PV (Pty) Ltd, proposes the construction of a photovoltaic (PV) solar energy facility, known as the Themeda PV facility, located on a site ± 7.5 km west of Lichtenburg in the North West Province. The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality and is accessible via Road P28-4 (R503), located immediately southwest of the development area. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 120 MW.

The main objective of the 'Transportation Study' is to determine the impact/s of the proposed development on the immediate and greater area concerning transportation. The assessment will comprise a site assessment and include preliminary transportation-related matters arising during the construction phase, through the operation & maintenance phase, up to and including the decommissioning phase of the development. The assessment of these phases will take into account the transportation of normal and abnormal vehicles, which are made up of, among other things; - PV components, construction materials, equipment, construction workers and employees.

The proposed Themeda PV Facility forms part of cluster development with an additional development adjacent to this facility as a separate EIA application: - Aristida PV. Although this report only focuses on the Themeda PV Facility, all two developments are considered for this study as they share common boundaries adjacent to each other.

Key Findings

We don't foresee any major risks concerning the proposed development and therefore include our recommendations in the report to take note of before and during the detailed design and construction stages. It should, however, be noted that several recommendations were highlighted and therefore stated as important.

The development is located in close proximity to an existing road network. Several existing access points are located along Road P28-4 (R503), and to accommodate the adjusted land use, the chosen access position obtains the recommended sight distances of 250 m. Approval and a wayleave application will be required from the North West Department of Public Works & Roads (NWDPWR) before work commences.

The construction phase for this development will typically generate the highest number of additional vehicles. However, it will be temporary, and impacts are considered nominal.

Several mitigation measures are proposed to accommodate the development and reduce the impact on the surrounding road network.

Recommendation

Concerning this report, associated assessment and the findings made within, it is SiVEST's opinion that the Themeda PV and associated grid infrastructure will have a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective, provided the recommendations and mitigation measures in this report are implemented. Hence, Environmental Authorisation (EA) should be granted for the EIA application.

DECLARATION BY SPECIALIST

I, MERCHANDT LE MAITRE, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of Specialist:



Name of Company: SiVEST SA (PTY) Ltd

Date: 5th August 2022

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Refer to Section 4 and Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer above
c) an indication of the scope of, and the purpose for which, the report was prepared;	Refer to Section 3
(cA) an indication of the quality and age of base data used for the specialist report;	Refer to Section 7.2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Refer to Section 9 Refer to Section 10
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Section 3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Refer to Section 3
f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Refer to Section 11
g) an identification of any areas to be avoided, including buffers;	N/A
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Figure 10:1
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Refer to Section 5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Refer to Section 7 Refer to Section 12
k) any mitigation measures for inclusion in the EMPr;	Refer to Section 9
l) any conditions for inclusion in the environmental authorisation;	Refer to Section 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Refer to Section 9
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance,	Refer to Section 12

management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

THEMEDA PV (PTY) LTD

THEMEDA PV FACILITY

TRANSPORTATION STUDY

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1. INTRODUCTION

SiVEST Civil Engineering Division was appointed by Themeda PV (Pty) Ltd. (hereafter referred to as "Themeda PV") to complete a Transportation Study for the proposed 120 MW Themeda PV Facility and associated grid infrastructure (hereafter referred to as the "proposed facility / facilities") situated \pm 7.5 km west of the town Lichtenburg and is within the Ditsobotla Local Municipality, the greater Ngaka Modiri Molema District Municipality of the North West Province.

The proposed facility and associated grid infrastructure north of Vryburg & Klerksdorp will not be located within Renewable Energy Development Zones (REDZ). However, the development is located between the 'Future Vryburg REDZ' and 'Existing Klerksdorp REDZ'.

The proposed Themeda PV Facility forms part of cluster development with an additional development adjacent to this facility as a separate EIA application: - Aristida PV. Although this report only focuses on the Themeda PV Facility, all two developments are considered for this study as they share common boundaries adjacent to each other.

2. PV FACILITY COMPONENTS

The PV facility will consist of the following:

2.1 Solar Farm Components

The proposed Themeda PV will comprise photovoltaic (PV) panels with a maximum total energy generation capacity of up to 120 MW. The electricity generated by the proposed PV development will be fed into the national grid via a 132 kV overhead power line. In summary, the proposed Themeda PV will include the following components:

- PV panels (number of will be determined in the design phase), connected in series to form a 'string' of panels. Several strings are connected in parallel to form an 'array of modules / panels', each typically between 4 MW and 7 MW, with a maximum export capacity of 120 MW. However, the final number of panels and layout of the PV will depend on the outcome of the Specialist Studies conducted during the EIA process, and detailed design process to be conducted in due course.
- Mounting structures that are either fixed, north-facing at a defined angle or single-axis tracking modules rotating in an east-west direction will be considered. (Will be determined at the design stage)
- Medium voltage electrical transformers (up to 33 kV) adjacent to each inverter station (typical footprint of up to approximately 3 m x 2.5 m) step up the voltage to between 11 kV and 33 kV.
- One (1) new up to 132 kV on-site substation including associated equipment and infrastructure.
- A Battery Energy Storage System (BESS) will be located next to the on-site 33/132 kV substation. The storage capacity and type of technology would be determined later during the development phase but most likely will comprise an array of containers and outdoor cabinets.
- A single inverter station is connected to several 'solar arrays' placed adjacent to the internal road.
- The inverter station will be connected to the proposed substation via medium voltage (up to 33 kV) cables. Cables will be buried underground along access roads wherever technically feasible.
- An overhead line servitude of up to 36 m wide for the the 132 kV line (to be located within a 100 m wide assessment corridor).
- Internal roads up to approximately 8 m wide will provide access to each PV panel and inverter station. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.

- One (1) construction laydown area of up to approximately ± 3.0 ha. It should be noted that no construction camps will be required to house workers overnight as all workers will be accommodated in the nearby town.
- Operation and Maintenance (O&M) buildings, including offices, a guard house, operational control centre, O&M area / warehouse / workshop, canteen, visitor centre, and ablution facilities to be located on the site identified as Auxiliary Buildings. This site area is approximately ± 1.0 ha.
- A new ± 2.0 m high perimeter fence around the site perimeter will be erected.
- Water will be sourced from existing boreholes within the application site or trucked in should the boreholes within the application site be limited.

3. OBJECTIVES AND SCOPE OF WORK

The main objective of the 'Transportation Study' is to determine the impact/s of the proposed development on the immediate and greater area concerning transportation. The assessment will comprise a site assessment and include preliminary transportation-related matters arising during the construction phase, through the operation & maintenance phase, up to and including the decommissioning phase of the development. The assessment of these phases will take into account the transportation of normal and abnormal vehicles, which are made up of, among other things; - PV components, construction materials, equipment, construction workers and employees.

The scope of work consists of the following:

- a) A site investigation (completed on the 30th March 2022).
- b) Consultations with the relevant authorities and / or stakeholders include collecting traffic data and information.
- c) Desktop analysis of traffic data and information from the various authorities and / or stakeholders. The analysis includes the evaluation of the road network's capacity (if required).
- d) Evaluate the impact of the proposed development on the existing road network / traffic volumes and populate a suitable 'Impact Rating System'.
- e) Determine specific traffic needs during the different phases of implementation.
- f) Conclude & propose possible mitigation measures.
- g) Identify the position and suitability of the preferred access road alternatives.
- h) Confirm the required clearances for the necessary equipment to be transported from the point of delivery to the various sites.
- i) Confirm freight and transport requirements during construction, operation and maintenance period.
- j) Propose origins and destinations of equipment.
- k) Determine Abnormal load requirements (if any).
- l) Seasonal impacts do not affect the assessment.

3.1 Legal Requirement & Guidelines

Key legal requirements and guidelines for the proposed facilities are as follows:

- Government Notice 509 (GN509), as published in Government Gazette 40229 of 2016 and refers to the National Water Act, 1998 (Act No. 36 of 1998)

- National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA)
- National Water Act, 1998 (Act No 36 of 1998) (NWA)
- Road Safety Act (Act No 93 of 1996)
- National Road Traffic Regulations, 2000

4. SPECIALIST CREDENTIALS

Merchandtm Le Maitre from SiVEST Consulting Engineers compiled this Transportation Study. He has a B Tech (Baccalaureus Technologiae) in Civil Engineering with over 17 years of experience, with 12 years in renewable energy. His extensive experience in the different facets of Civil Engineering means he can advise clients in the renewable energy sector in; geotechnical engineering, topographical studies, stormwater management, water demand, transportation studies, access / layout designs and glint & glare assessments. A full Curriculum Vitae is included in 'Appendix A.'

Table 4:1 Specialist Credentials & Experience

Company	SiVEST (Pty) Ltd
Contact Details	merchandtm@sivest.co.za
Qualifications	B Tech (Baccalaureus Technologiae) in Civil Engineering
Professional Registrations & Memberships	<ul style="list-style-type: none"> • Pr. Tech Eng – Engineering Council of South Africa • MSAICE – Member of South African Institute of Civil Engineers • SAWEA – South African Wind Energy Association
Expertise to carry out the Transportation Study	<ul style="list-style-type: none"> • Tooverberg WEF • Umsobomvu PV • Droogfontein 3 PV • Mierdam PV • Dwarsrug PV • Platsjambok West PV • Platsjambok East PV • Loeriesfontein 3 PV • Koeris BESS • Koup 1 & 2 WEF • Beaufort West WEF • Lephalale Solar Project

5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are to be noted:

- The analysis is based on the information provided at the time by Themeda and its representatives.
- Digital Terrain Model: 25m DEM from NGI (2014) & 2m DEM from GeoSmart (2016:2626AA)
- Technical Specifications for the Facility:

Table 5:1 Technical Specification for Themeda PV Facility

Technical Component	Dimensions
PV Tracking System	Fixed axis tracking has been used for these simulations as it has the most significant impact on the surrounding road network
Height of PV Panels	≤ 5.5 m
Area of PV Array	± 251 ha
Number of Panels and Inverters	To be determined at the detailed design phase
Area of Inverter / Transformer stations / substations /	The inverter / transformer stations will be located within the area of the PV array, while the main HV transformers will be located within the substation complex
BESS	Up to 4 ha
Voltage of Substation Complex	11 kV / 132 kV – 33 Kv / 132 kV
Area of Substation Complex	≤ 3 ha
Height of Substation Complex	≤ 25 m
The area occupied by laydown areas (Permanent and Construction)	Temporary Laydown Area: ± 5 ha (per facility) Permanent Laydown Area: Less than ± 1 ha will remain in place for operations (per facility)
The area occupied by Buildings	≤ 1 ha for a site office and O&M buildings
Length of Access Road	≤ 3 km
Width of Access Road	Up to 8 m
Length of Internal Roads	≤ 25 m
Width of Internal Roads	Up to 8 m
Construction Period	± 12 months

- Traffic Station Data / Counts and trip generation calculations are for one direction only and do not include return trips unless indicated.
- This assessment is limited to the impact of the development traffic on the network, not on the wider impacts known as background traffic. Such impacts can only be addressed in a detailed Traffic Impact Study, which considers actual traffic counts undertaken during peak periods.
- The information provided in this report is an informed estimate. However, construction-related traffic may vary and be different from the information provided during construction phases because of supplier delivery schedule changes.
- Some of the figures provided are indicative as many of the components are still at the design stage and will only be confirmed closer to the construction time.

6. PROJECT DESCRIPTION

6.1 Locality

Themeda PV facility and associated infrastructure are located ± 7.5 km west of Lichtenburg in the North West Province. The facility is adjacent to regional road P28-4 (R503) between Lichtenburg and Bakerville (Refer to **Figure 6:2**) in the Ditsobotla Local Municipality and greater Ngaka Modiri Molema District Municipality as indicated in **Figure 6:1**.

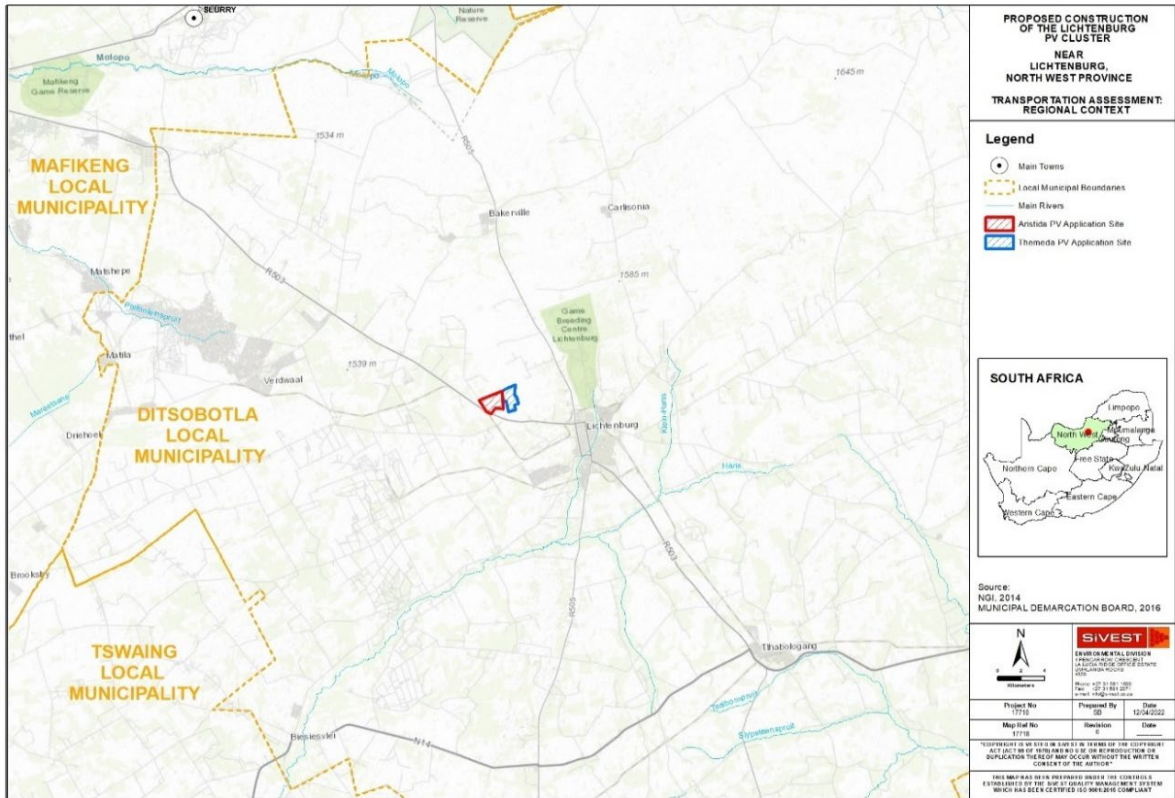


Figure 6.1 Themeda PV - Regional Context

The PV facility will be located on the following properties (Refer to **Figure 6.2**):

- Portion 7 of the Farm Elandsfontein 34

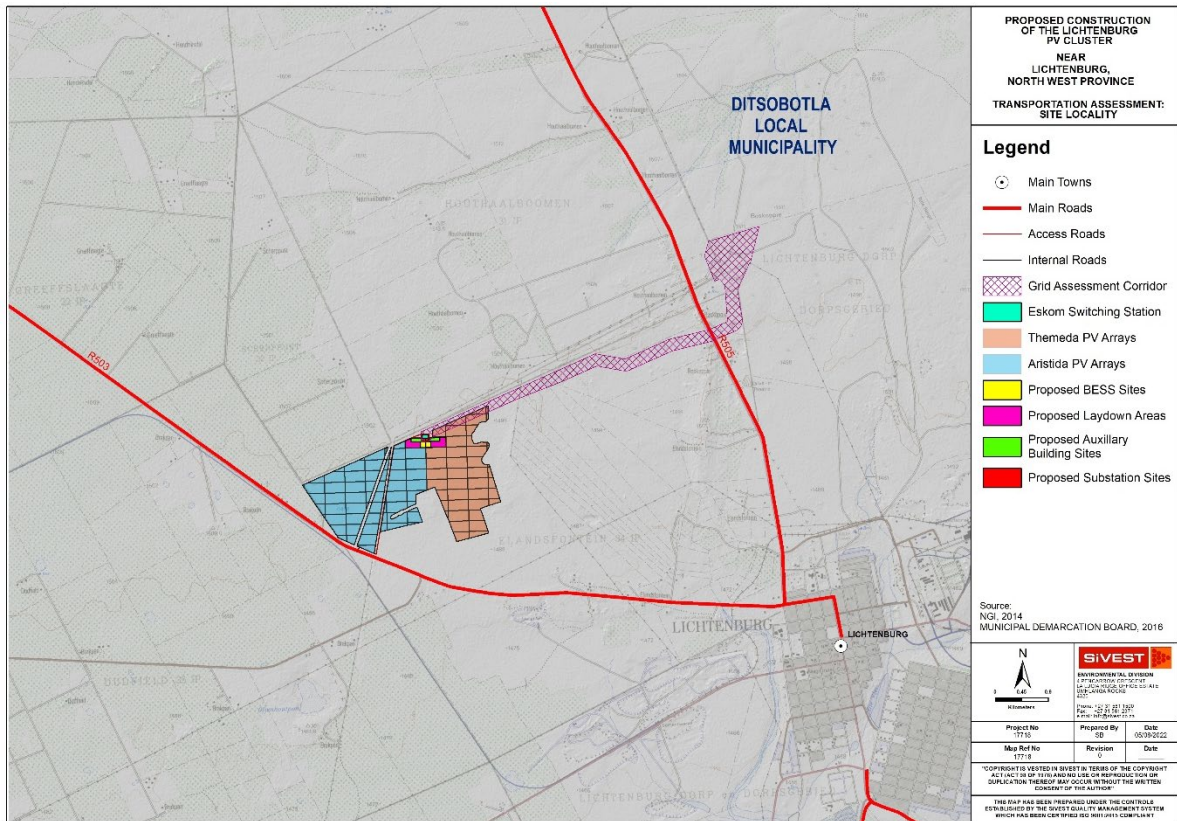


Figure 6.2 Themeda PV - Site Locality (Beige)

7. TRANSPORTATION

Portion 7 of the Farm Elandsfontein 34 obtains access from Road R503; the Themeda PV development does not have direct access from the surrounding road network; however, the development is near national and provincial roads where access can be obtained.

Regional road P28-4 (R503) is located to the south of the development and is currently being managed by the North West Department of Public Works & Roads (NWDPWR). The intention is to register a new Right of Way (ROW) servitude over the Themeda PV development with the landowner to provide access between the development and Road P28-4 where direct access can be obtained. The intention is to apply for a new farm access and complete minor upgrades to accommodate the intended vehicles from the adjusted land use.

The site, respective access points and internal layouts will be discussed in more detail in the sections below.

7.1 Existing Road Network

The existing road network surrounding the proposed development is well established and provides a high degree of mobility and access. The mobility roads join the major centres and towns with each other, while access roads provide access roads to serve smaller nodes and individual properties.

The existing road networks in the North West Province are predominantly mobility roads; in most cases, the arterials and collector roads are surfaced. The surfaced roads are generally in a fair condition with many of the roads requiring remedial action in the short and medium term.

Roads impacting this development have been indicated in **Figure 7:1** and summarised in **Table 7.1** below.

Table 7:1 Summary of Existing Road Network

Route	Surface	RCAM Class	Section	Jurisdiction
R50505 (R505)	Asphalt	R3	Lichtenburg – Ottoshoop	SANRAL
DR2435	Gravel	R5	R50505	NWDPWR
DR2095	Gravel	R4	Bakerville	NWDPWR
DR2379	Gravel	R4	Klipkuil	NWDPWR
P28/4 (R503)	Asphalt	R2	Lichtenburg - Mahikeng	NWDPWR

* NWDPWR – North West Department Public Work & Roads

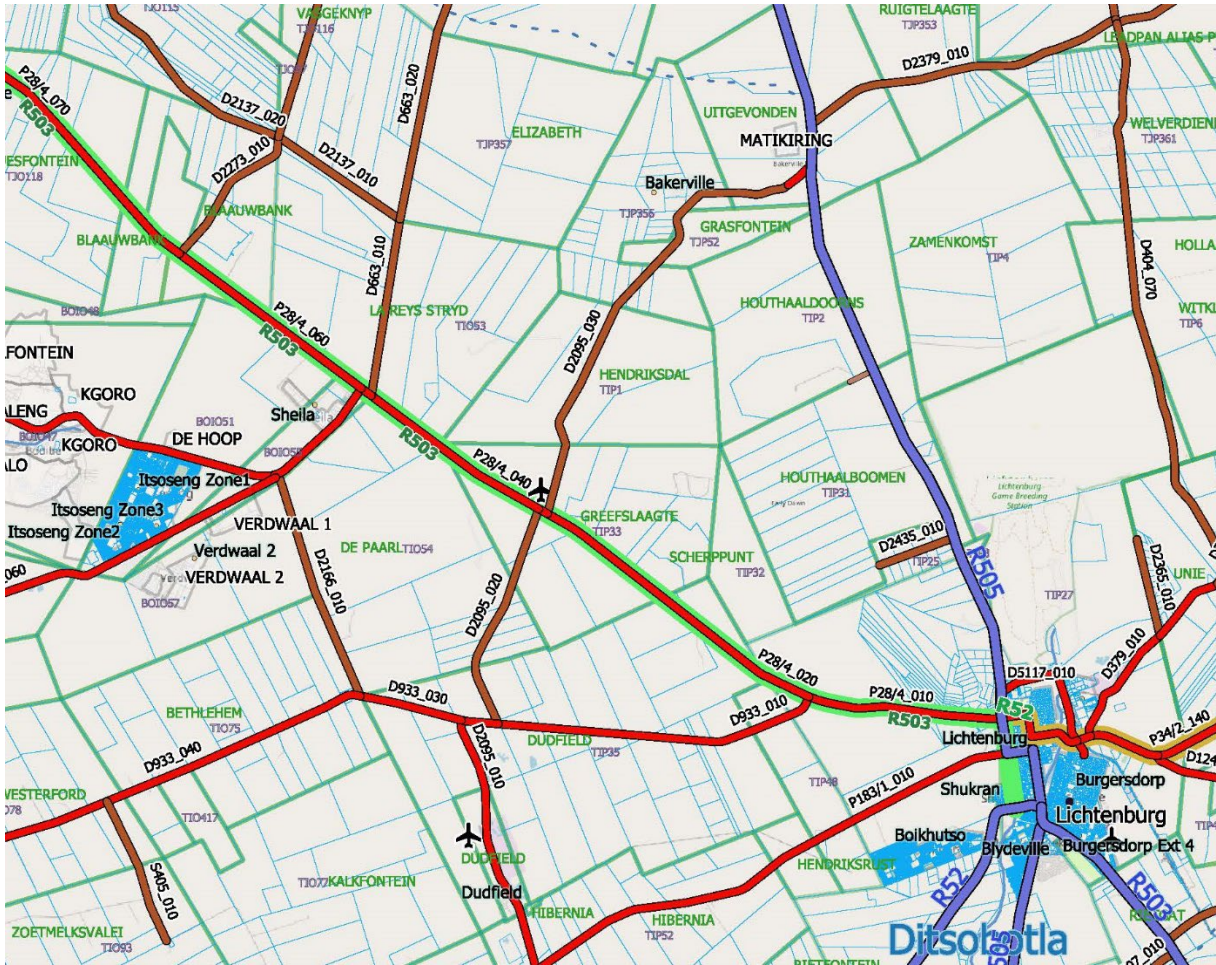


Figure 7.1 Existing Road Network (North West Department of Public Works & Roads – RAMS)

7.2 Existing Traffic Conditions

Existing traffic data for Road P28-4 and Road R50505 were obtained from the NWDPR and SANRAL.

Table 7:2 Traffic Data / Counts for Road P28-4

Route	Site ID	Distance (Km)	Location	Traffic Stream (TS) to		Lanes	Light Vehicles	Heavy Vehicles (ADTT)	Total Vehicles (ADT)	Highest Vol (Time of Day)	
				TS1	TS2					TS1	TS2
P28/4 (01)	P0010	Km 0-6	Lichtenburg	Lichtenburg	Mahikeng	2	7100*	1853*	8953*	N/A	
P28/4 (02)	P0020	Km 2-6	Lichtenburg	Lichtenburg	Mahikeng	2	5202	664	5866	N/A	
P28/4 (04)	P0040	Km 2-6	Lichtenburg	Lichtenburg	Mahikeng	2	7496*	525*	8514*	N/A	
P28/4 (06)	P0060	Km 2-6	Lichtenburg	Lichtenburg	Mahikeng	2	4046	457	4503	N/A	

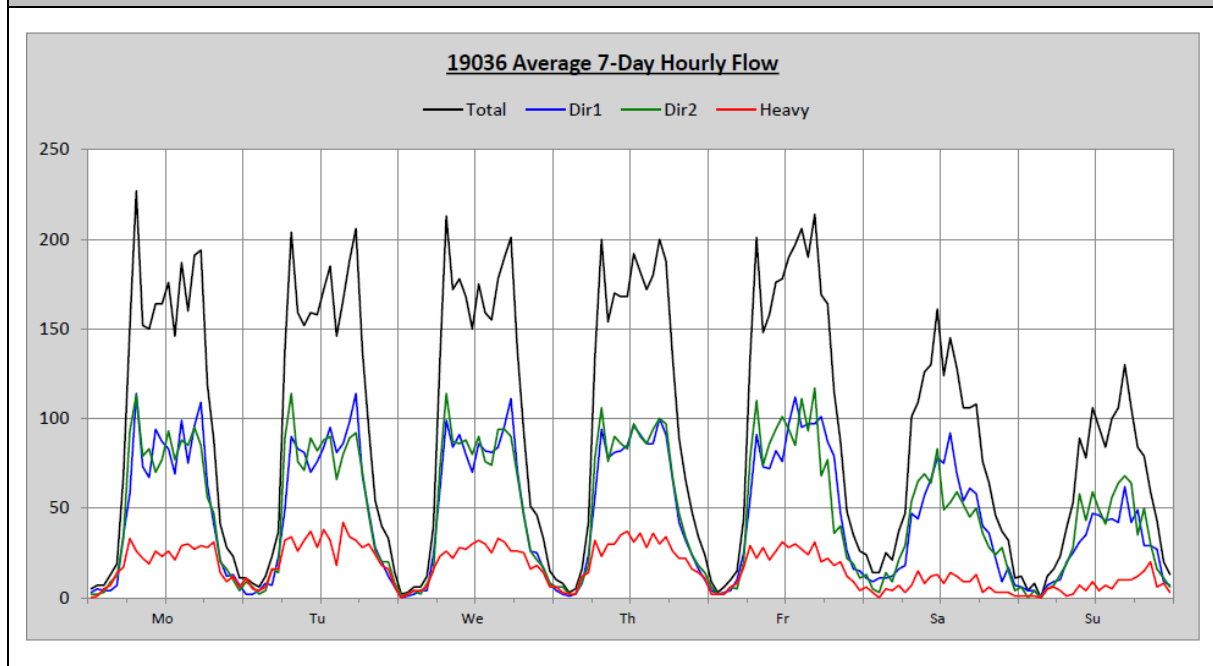
*Information from the NWDPR incorrect

All four (4) sections of Road P28-4 above are located between Lichtenburg and Mahikeng, with minor intersecting roads joining the road between each section. The minor roads joining Road P28-4 do not add the traffic volume to explain the inconsistent data in the table above.

Table 7:3 Traffic Data / Counts for Road R50506N

	Light Vehicles	Heavy Vehicles	Total Vehicles	Directional Split (North : South)
R50506N				
Km 4.36				
Station No: Temporary				
Date: 2018/10/30 – 2018/11/09				
Morning 7:00-8:00	186	27	213	46.5 : 53.5
Afternoon 16:00-17:00	181	32	213	55.2 : 44.8
Average Annual Daily Trips	1983	298	2281	49.5 : 50.5

Station Count Chart



Although hourly recorded traffic data was not available from the NWDPR, the data received from SANRAL in **Table 7:3** could be used as an indication of the peak periods, as both roads are mobility roads between major centres or towns. Therefore, the peak periods for Road P28-4 are assumed to be in the morning (AM) and afternoon (PM). Furthermore, the figures and tables above indicate the roads are below ± 2500 vph (vehicles per hour) for a typical two-lane two-way road.

7.3 Additional Traffic Generation

The construction phase typically generates the highest number of trips for the proposed facility. Construction will typically involve access roads, foundations, frames, PV panels, electrical cables / transformers / switch gears / substations / BESS installations and the delivery of these materials / equipment / abnormal loads on the public road network.

It is assumed that no staff or labour will reside on the construction site, other than security, and therefore all will reside in the town Lichtenburg or nearby towns.

7.3.1 Construction Phase

Calculations and our experience from previous PV developments confirm the construction phase will generate the greatest additional traffic to the surrounding road network. The impact will be on the surrounding road network, increasing dust generation, noise and road maintenance.

The civil construction period for PV developments typically takes place between months 2 – 8 on a development of this size. This development of ± 251 ha PV panels will generate a total of ± 38 additional vehicle trips per day for this period on the surrounding road network. Of these vehicle trips, ± 23 vehicle trips will occur at the peak of the construction phase transporting staff and labour. Typically, these trips will be in the morning between 6:00 – 7:00 and the afternoons between 17:00 – 18:00. These trips will coincide before the 'morning' and after the 'afternoon' peak periods.

The remaining ± 15 vehicle trips will mostly occur during the 'weekday midday' period to deliver construction material. Of these ± 15 vehicle trips, less than one will be abnormal loads (discussed further in **Section 7.3.1.1**). Assuming a 9 hr workday, the ± 15 vehicles during the 'weekday midday' period will equate to ± 2 vehicle trips / hour.

In terms of *TMH16 - South African Traffic Impact and Site Traffic Assessment Manual*, this development generates less than 50 peak hour trips, and hence a 'Traffic Impact Assessment' will not be required. The resultant impact of this development on the surrounding road network during the construction period is therefore seen as minimal.

The specific traffic needs for this phase of the development.

- Reduction in vehicle speed
- Reduction in dust generation
- Adequate law enforcement
- Appropriate, timely and high-quality maintenance of roads
- Implementation of pedestrian safety initiatives
- Regular maintenance of farm fences and access cattle grids
- Continuous engagement with the North West Department of Public Works & Roads (NWDPWR).

7.3.1.1 Abnormal Loads

Abnormal loads are described as loads that, for all practical purposes, cannot be transported on a vehicle or vehicle without exceeding the limitations described in the 'National Road Traffic Regulations (2000)'.

These vehicles exceed the limitations as a result of one of the following.

- Dimension Abnormality
 - Length

- Width
- Height
- Overhangs
- Load Projections
- Wheelbase
- Mass Abnormality

The transportation of abnormal loads from their origin to the proposed facility has been assumed to be primarily from Gauteng and the Port of Durban. Therefore, for this assessment, it has been assumed all equipment such as electrical transformers, switch gear etc. and site establishment equipment in the form of construction equipment and offices from Gauteng and BESS from the Port of Durban.

Examples of the office transportation methods (**Figure 7:2**) and construction equipment (**Figure 7:3**) are included below.

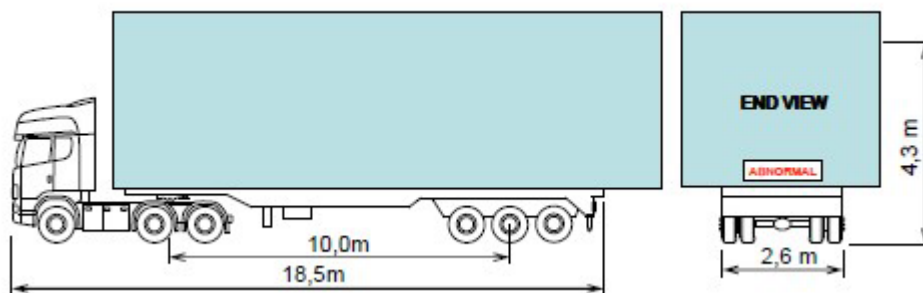


Figure 7.2 Abnormal Load on Legal Combination

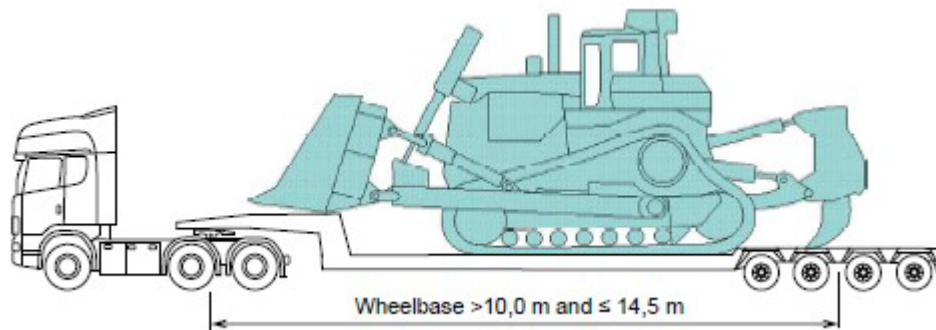


Figure 7.3 Abnormal Load on Long Wheelbase Trailer

The geometric clearance requirements associated with transporting these abnormal loads are shown in **Table 7:4** below. However, we note that the figures above and the table below are indicative as many of the components are still at the design stage and will only be confirmed closer to the construction time.

Table 7:4 Abnormal Load Dimensions

Abnormal Load Dimensions			
Transported Load	Typical Dimensions		
	Length (m)	Width (m)	Height (m)
Transformers & Switch Gear	27	4.5	4.5

Abnormal Load Dimensions			
Construction Equipment	13	4.0	4.5

* Please note the values above are estimates based on data currently available

Before any Abnormal Load conveying equipment to the facility, approval must be obtained in the form of a permit from the Department of Transport (DoT). The permit application will be completed by specialists in the transportation of Abnormal loads and will conform to 'The Road Traffic Act, 1996 (Act No 93 of 1996)'. The application includes route clearances from Telkom and Eskom, after which the application is submitted to DoT. They, in turn, consult with the SANRAL and each Local Municipality and Provincial Authority travelling through before issuing a permit.

7.3.1.2 Permitting for Abnormal Loads – General Rules

The limits recommended in *TRH 11 - Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads* are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

- A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, and abnormally heavy traffic during specific periods or for any other reason.
- A permit can be withdrawn if the vehicle is found unsuitable to be operated upon inspection.
- During specific periods, such as school holidays or long weekends, an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

7.3.1.3 Proposed Normal & Abnormal Load Routes

The transportation of Normal & Abnormal goods has been indicated in **Figure 7:4** below and will be primarily from Gauteng and the Port of Durban.

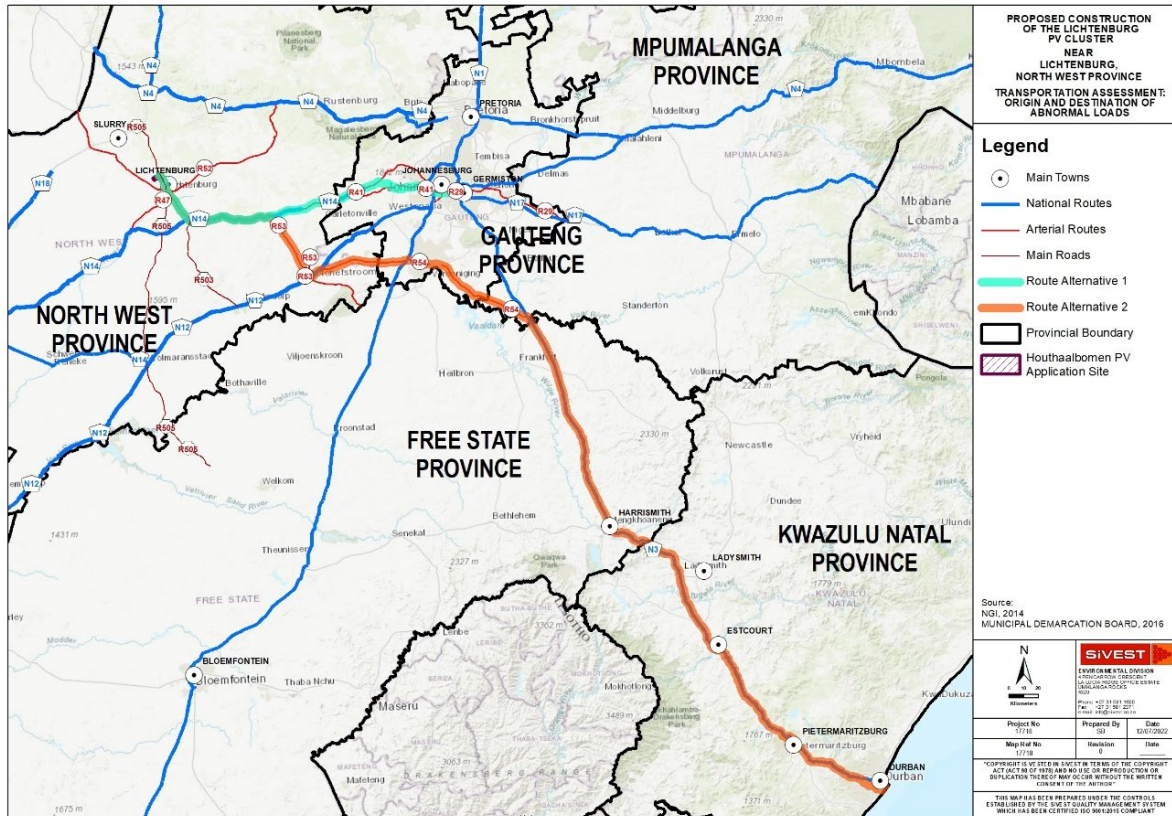


Figure 7.4 Normal & Abnormal Load Transport Routes

We recommend that a more comprehensive route analysis be completed before construction to better understand the works required and the potential risks.

7.3.2 Operation & Maintenance Phase (O&M)

The Themeda PV has been designed with a 20 – 25 year lifespan and could be increased if financially viable. The O&M during the 20 – 25 year period will typically be in the form of a small general maintenance team during the O&M period. Any maintenance required, including a new transformer or switch gear, will be classified as an abnormal load, and the traffic generated by this will be negligible in the greater scheme of the development. The most significant contributor of traffic in this phase will therefore only comprise employees commuting to and from the site.

We assume a maximum number of ± 50 employees will be employed during the project's 20 – 25 year life span. Therefore, the assumption is that the employees will commute together; hence, a total of ± 20 additional trips will be added to the existing road network during the morning and afternoon. In addition to the staff, commuting will be the collection of waste and sanitation. These are assumed to generate an additional ± 2 vehicles / week onto the existing road network; therefore, the sum of this phase will have a low to negligible impact.

The specific traffic needs for this phase of the development.

- Reduction in vehicle speed.
- Reduction in dust generated.
- Adequate law enforcement.
- Appropriate, timely and high-quality maintenance of gravel roads.
- Implementation of pedestrian safety initiatives.

- Regular maintenance of farm fences and access cattle grids; and
- Continuous engagement with the North West Department of Public Works & Roads (NWDPWR).

7.3.3 Decommissioning Phase

Decommissioning of the Themeda PV will generate considerably fewer trips than the construction phase. It is estimated that the decommissioning phase will generate an additional ± 10 vehicles / day over a period of 12 – 14 months. The material removed will be transported back to Gauteng for recycling. The impact of this phase will therefore be low.

The specific traffic needs for this phase of the development.

- Reduction in vehicle speed.
- Reduction in dust generated.
- Adequate law enforcement.
- Appropriate, timely and high-quality maintenance of gravel roads;
- Implementation of pedestrian safety initiatives.
- Regular maintenance of farm fences and access cattle grids; and
- Continuous engagement with the North West Department of Public Works & Roads (NWDPWR).

7.4 Themeda PV – External Access & Road Upgrades

The Themeda PV facility will be located on Portion 7 of the Farm Elandsfontein 34, with one (1) possible access point emanating from Road P28-4 (R503). Access 1 as indicated in **Figure 7:5** and **Table 7:5** below.

The access point for the proposed development are:

Table 7:5 Themeda PV - Proposed Access Positions

Access No.	Road No.	Position	Access Status	Location	
Access 1	P28-4	Km 7.15	New Gravel	26°08'01.39" S	26°04'45.00" E

This new road is ±3.0 km long and obtains access from Road P28-4 (R503). The route continues north within the Themeda PV development, not following any cadastral boundaries towards the northern farm boundary, where the road turns in an easterly direction towards the site access, O&M buildings, laydown areas, BESS and substation.

The regional road P28-4 (R503) is maintained under the auspices of NWDPWR and is classified as a Class R2 in terms of the RCAM Classification – Major Arterial Road with an average road reserve width of 36 m and a road surface of 6.0 m wide and a 2 m wide surfaced shoulder on both sides. The road has a design speed of 80 km/h.

The proposed access points are located along Road P28-4, which is indicated in the images below. The minimum required sight distance applicable to a road at 80 km/h is 250 m. Hence, the current sight distance of >350 m west and >350 m east approaching is achieved at the proposed access location. and therefore the proposed access point is acceptable.

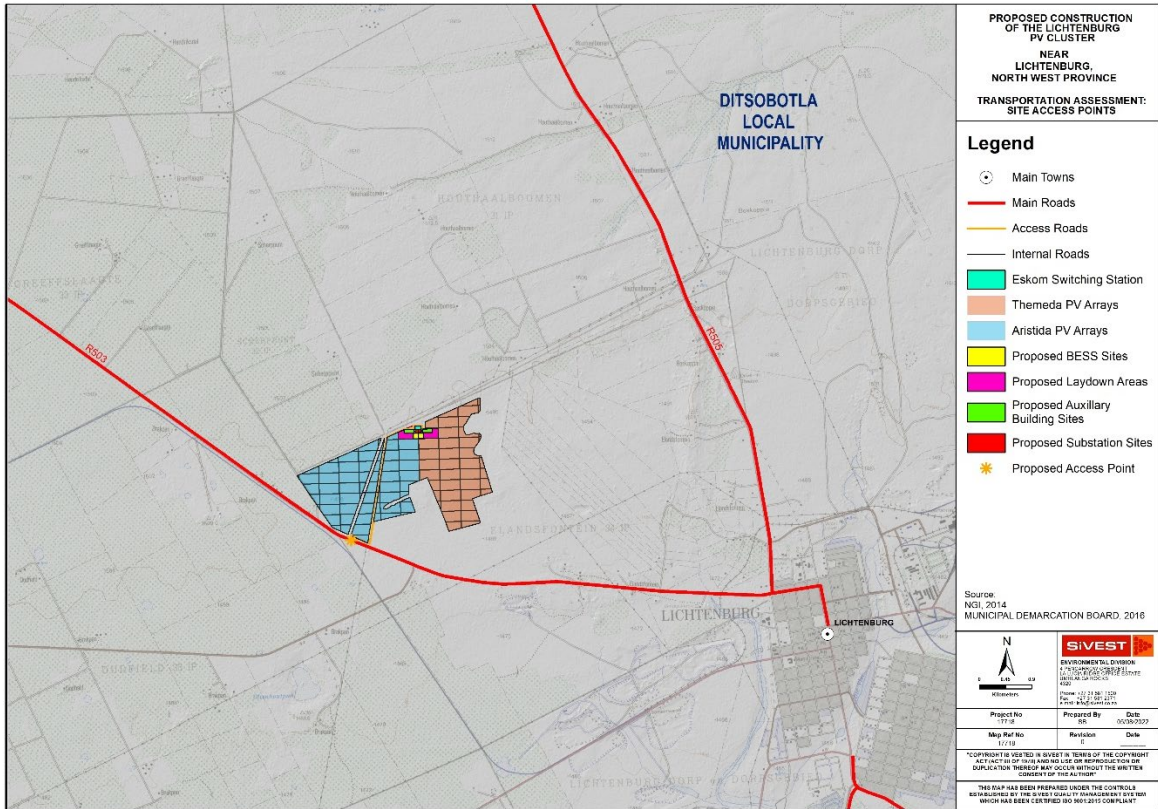


Figure 7.5 Themeda PV - Internal Layouts showing access point (beige)



Figure 7.6 Existing Road P28-4 @ Km 7.15 – East Approaching (Access 1)



Figure 7.7 Existing Road P28-4 @ Km 7.15 – West Approaching (Access 1)



Figure 7.8 Proposed Access 1 from Road P28-4 @ Km 7.15

The development will require a new access point, and approval will need to be obtained from NWDPR. The respective internal road to the proposed development will also require upgrades to accommodate the proposed adjusted land use. The access point has sufficient sign distances on both approaches.

Table 7:6 Themedra PV - Access Road Summary

Access	Status	Access Upgrades on Road P28-4	Access Road Upgrades
Access 1	New Access	Full Upgrade	Full ±3.00 km

Most of the additional traffic generated from the Themedra PV Facility and associated grid infrastructure can be accommodated on the existing road network and include both normal and abnormal vehicles.

7.5 Design Considerations

Based on our recent discussions with the NWDPR, new Land Use applications must be sent to their department for approval with the proposed new access position. As part of the application, the expected traffic during construction and the O&M phase, available sight distances including photographs and the affected stormwater structures are to be included. The Original Equipment Manufacturers (OEM) and the NWDPR's minimum requirements will need to be considered during the design stage.

The access point from Road P28-4 falls within the jurisdiction of NWDPR; their standard access requirement is based on TRH 17, TRH 4 and TRH 26. An example of the Gautrans – Typical Farm Access Detail is included in **Figure 7.10** below.

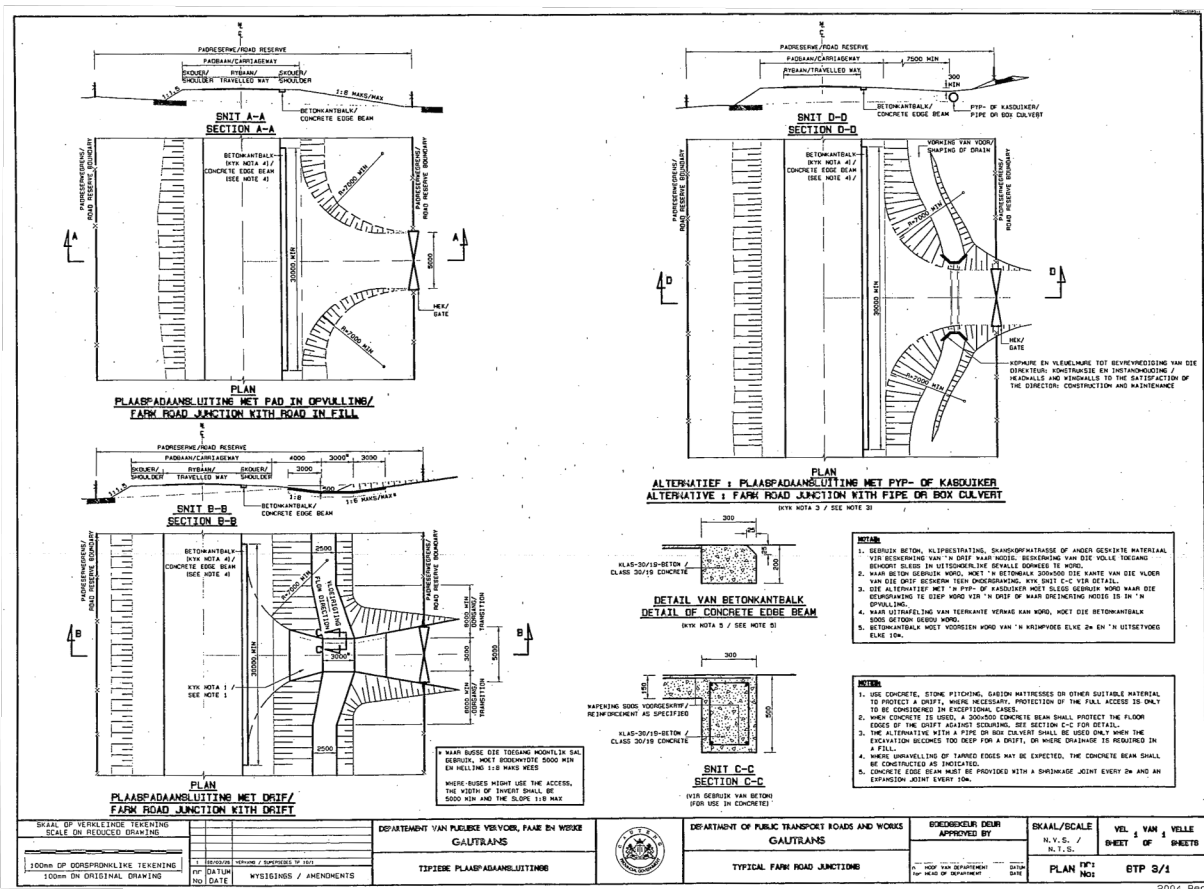


Figure 7.9 Typical Gautrans Intersection and Farm Access Detail

Typical cross-sections for gravel roads have been indicated in **Figure 7.12** and need to take into account the minimum requirements from OEM's.

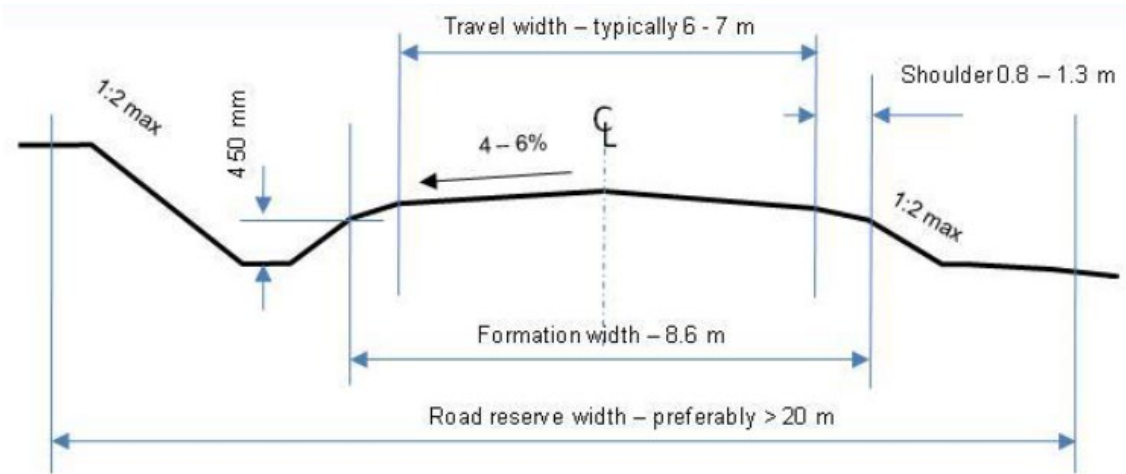


Figure 7.10 Typical Provincial Gravel Road Cross Section

The specific design considerations for this development are:

- Reduction in vehicle speed.
- Adequate law enforcement.
- Implementation of pedestrian safety initiatives.
- Regular maintenance of farm fences and access cattle grids.
- Adequate road signage as per the latest South African Road Traffic Sign Manual (SARTSM) edition.
- Possible use of approved dust suppressant techniques.
- Appropriate, timely and high-quality maintenance of existing gravel roads in terms of TRH20.
- Design and construction of new gravel roads in terms of TRH20.
- Continuous engagement with OEM and Abnormal Load specialists; and
- Constant engagement with the North West Department of Public Works & Roads (NWDPR).

However, we should note that the figures indicated above are indicative as many of the components are still at the design stage and will only be confirmed closer to the construction time.

8. INTERNAL LAYOUTS

The layout of the internal infrastructure is such that the environmental impact is kept to a minimum. We, therefore, propose that 'Access 3' to the Facility be considered (Refer to **Figure 8:1**).

All internal access roads should be designed to have a minimal impact on the environment and thus are in most cases, parallel to the contours to keep drainage line crossings to a minimum. The use of roads perpendicular to the contours for long sections should be avoided, as the risk of possible erosion is increased. Existing gravel roads should be considered in order to reduce the environmental impact.

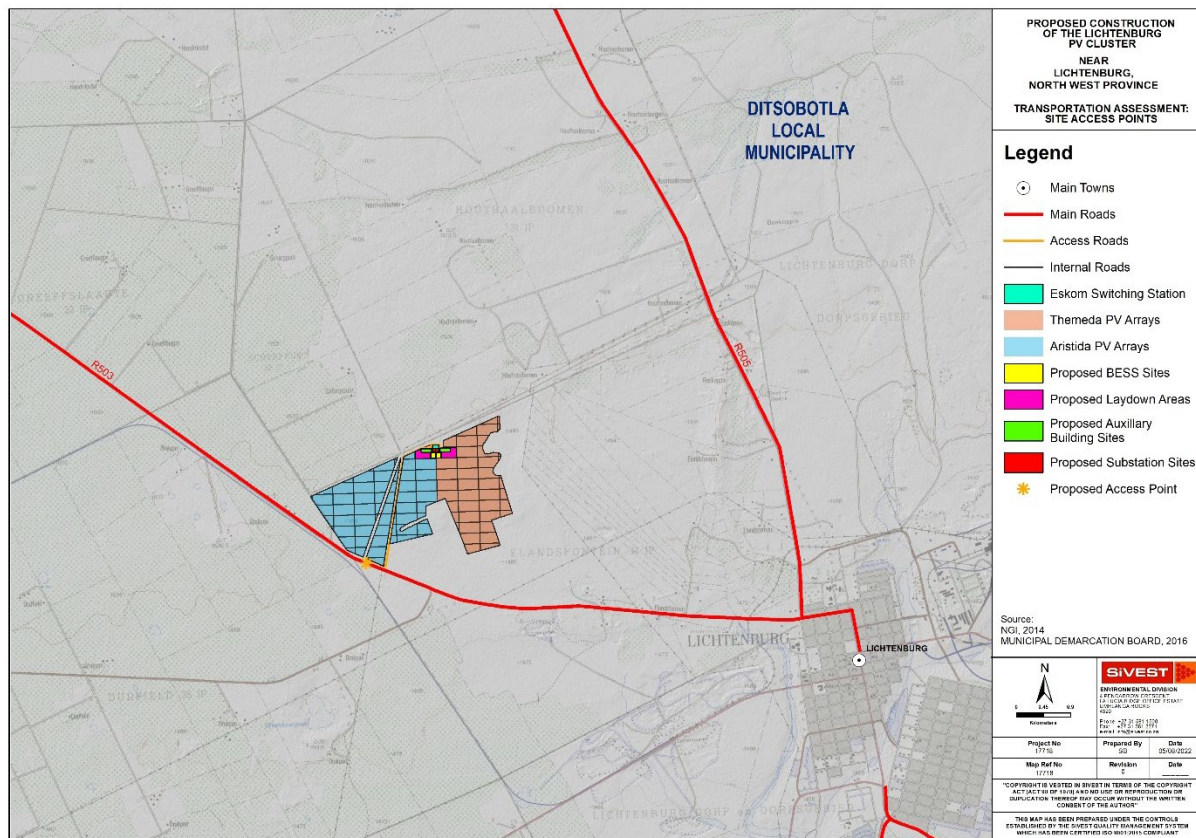


Figure 8.1 Themeda PV - Internal Layouts showing access point (in cyan)

An internal network of roads has been assumed to be in a traditional grid pattern formation and will mainly consist of 5m wide gravel roads. The roads will have a horizontal and vertical alignment to accommodate vehicles and, more specifically, vehicles intended to use these roads to deliver and maintain the PV equipment.

We recommend that all internal access roads take the PV facility stormwater management plan into account, where possible and applicable, to reduce potential erosion risks.

In addition, we recommend that all internal access roads are constructed according to *TRH20 – Unsealed Roads: Design Construction and Maintenance*. For this assessment, we have assumed that the in-situ material below the topsoil is of 'G7' quality and can be used as a suitable road subgrade material, followed by an imported 'Gravel Wearing Course' material.

A suitable geotechnical study will however be required at predesign stage to understand better the design limitations on the development, followed by a preliminary design to 'value' Engineer the project.

9. IMPACT RATING ASSESSMENT

The 'Impact Rating System' considers the nature, scale and duration of the effects on the environment, and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning
- Construction
- Operation
- Decommissioning

A rating points-based system is applied to the potential environmental impacts and includes objective evaluations of the impact mitigation. These impacts can be found in **Figure 9.2** below.

In summary, all impacts were classified as 'Medium to Low' with a large majority of the impacts changing to 'Low' after implementing suitable mitigation measures. This rating applies to all alternatives considered.

9.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) are used:

Table 9:1 Rating of Impacts Criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of the environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted by a particular action or activity (e.g., an oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	The impact will certainly occur (With greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with the implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.

3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resources.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in a significant loss of resources.
4	Complete loss of resources	The impact results in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through a natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a period that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact can alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but the system / component continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	The impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of

		rehabilitation and remediation.
4	Very high	The impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation are often impossible. If possible rehabilitation and remediation are often unfeasible due to the extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.		
The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderately positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Table 9:2 Themeda PV – Impact Rating Table

THEMEDA PV FACILITY																				
ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Construction Phase																				
Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	3	30	-	Medium	<ul style="list-style-type: none"> • Ensure staff transport is done in the 'off peak' periods and by bus, if possible • Stagger material, component, and abnormal loads delivery. 	2	4	1	2	1	2	20	-	Low
	Increase of Incidents with pedestrians and livestock	2	3	2	4	1	2	24	-	Medium	<ul style="list-style-type: none"> • Upgrade of existing / new access points. • Reduction in the speed of vehicles. • Adequate enforcement of the law. • Implementation of pedestrian safety initiatives. • Regular maintenance of farm fences & access cattle grids. 	2	3	2	4	1	1	12	-	Low
	Increase in Dust from gravel roads	2	3	2	2	1	2	20	-	Low	<ul style="list-style-type: none"> • Upgrade of existing / new access point. • Reduction in the speed of the vehicles. • Construction of gravel roads in terms of TRH20. • Implement a road maintenance program under the auspices of the respective transport department. • Possible use of approved dust suppressant techniques.. 	2	3	2	2	1	2	20	-	Low
	Increase in Road Maintenance	2	3	2	2	2	2	22	-	Low	<ul style="list-style-type: none"> • Implement a road maintenance program under the auspices of the respective transport department. 	2	3	2	2	1	2	20	-	Low
Abnormal Loads	Additional Abnormal Loads	3	3	1	2	1	1	10	-	Low	<ul style="list-style-type: none"> • Ensure abnormal vehicles travel to and from the proposed development in the 'off peak' periods or stagger delivery. • Adequate enforcement of the law. 	3	2	1	2	1	1	9	-	Low
Internal Access Roads	Increase in Dust from gravel roads	1	4	1	1	1	2	16	-	Low	<ul style="list-style-type: none"> • Enforce a maximum speed limit on the development. • Appropriate, timely and high-quality maintenance required in terms of TRH20. • Possible use of approved dust suppressant techniques. 	1	3	1	1	1	2	14	-	Low
	New / Larger Access points	1	4	1	2	1	1	9	-	Low	<ul style="list-style-type: none"> • Adequate road signage according to the SARTSM. • Approval from the respective roads department. 	1	4	1	2	1	1	9	-	Low
Operational Phase																				

Additional Traffic Generation	Increase in Traffic	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact.	2	1	1	2	3	1	9	-	Low
	Increase of Incidents with pedestrians and livestock	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact.	2	1	1	2	3	1	9	-	Low
	Increase in Dust from gravel roads	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact.	2	1	1	2	3	1	9	-	Low
	Increase in Road Maintenance	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact.	2	1	1	2	3	1	9	-	Low
Abnormal Loads	Additional Abnormal Loads	3	1	1	2	3	1	10	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact.	3	1	1	2	3	1	10	-	Low
Internal Access Roads	New / Larger Access points	1	1	1	2	3	1	8	-	Low	• Adequate road signage according to the SARTSM. • Approval from the respective roads department.	1	1	1	2	3	1	8	-	Low
Decommissioning Phase																				
Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	3	30	-	Medium	• Ensure staff transport is done in the 'off peak' periods and by bus. • Stagger material, component, and abnormal loads delivery.	2	4	1	2	1	2	20	-	Low
	Increase of Incidents with pedestrians and livestock	2	3	2	4	1	2	24	-	Medium	• Reduction in the speed of vehicles. • Adequate enforcement of the law. • Implementation of pedestrian safety initiatives • Regular maintenance of farm fences & access cattle grids.	2	3	2	4	1	1	12	-	Low
	Increase in Dust from gravel roads	2	3	2	2	1	2	20	-	Low	• Reduction in the speed of the vehicles. • Appropriate, timely and high-quality maintenance required in terms of TRH20. • Possible use of approved dust suppressant techniques. • Implement a road maintenance program under the auspices of the respective transport department.	2	3	2	2	1	2	20	-	Low
	Increase in Road Maintenance	2	3	2	2	2	2	22	-	Low	• Implement a road maintenance program under the auspices of the respective transport department.	2	3	2	2	1	2	20	-	Low
Abnormal Loads	Additional Abnormal Loads	3	2	1	2	1	1	9	-	Low	• Ensure abnormal vehicles travel to and from the proposed development in the 'off peak' periods or stagger delivery. • Adequate enforcement of the law.	3	2	1	2	1	1	9	-	Low
Internal Access Roads	Increase in Dust from gravel roads	1	4	1	1	1	1	8	-	Low	• Enforce a maximum speed limit on the development. • Appropriate, timely and high-quality maintenance required in terms of TRH20. • Possible use of approved dust suppressant techniques.	1	3	1	1	1	2	14	-	Low
	New / Larger Access points	1	4	1	2	1	1	9	-	Low	• Adequate road signage according to the SARTSM. • Approval from the respective roads department.	1	4	1	2	1	1	9	-	Low

Cumulative																				
Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	4	40	-	Medium	<ul style="list-style-type: none"> • Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off peak' periods or by bus. • Coordination between all developers in the area. 	2	4	1	2	1	3	30	-	Medium
	Increase of Incidents with pedestrians and livestock	2	3	2	4	1	3	36	-	Medium	<ul style="list-style-type: none"> • Reduction in the speed of vehicles. • Adequate enforcement of the law. • Implementation of pedestrian safety initiatives. • Regular maintenance of farm fences, and access cattle grids. • Coordination between all developers in the area. 	2	3	2	4	1	2	24	-	Medium
	Increase in Dust from gravel roads	2	3	2	2	1	4	40	-	Medium	<ul style="list-style-type: none"> • Reduction in the speed of the vehicles. • Construction of gravel roads in terms of TRH20. • Implement a road maintenance program under the auspices of the respective transport department. • Possible use of approved dust suppressant techniques. • Coordination between all developers in the area. 	2	3	2	2	1	2	20	-	Low
	Increase in Road Maintenance	2	3	2	2	2	2	22	-	Low	<ul style="list-style-type: none"> • Implement a road maintenance program under the auspices of the respective transport department. • Coordination between all developers in the area. 	2	3	2	2	2	2	22	-	Low
Abnormal Loads	Additional Abnormal Loads	3	3	1	2	1	4	40	-	Medium	<ul style="list-style-type: none"> • Ensure abnormal vehicles travel to and from the proposed development in the 'off peak' periods. • Adequate enforcement of the law. • Coordination between all developers in the area. 	3	2	1	2	1	2	18	-	Low
Internal Access Roads	Increase in Dust from gravel roads	1	4	1	1	1	3	24	-	Medium	<ul style="list-style-type: none"> • Enforce a maximum speed limit on the development. • Appropriate, timely and high-quality maintenance required in terms of TRH20. • Possible use of approved dust suppressant techniques. 	1	3	1	1	1	2	14	-	Low
	New / Larger Access points	1	4	1	2	1	2	18	-	Low	<ul style="list-style-type: none"> • Adequate road signage according to the SARTSM. • Approval from the respective roads department. 	1	4	1	2	1	1	9	-	Low

10. CUMULATIVE IMPACT ASSESSMENT

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments within 35 km of the proposed PV facility and associated grid infrastructure, however many of the documents are not currently, publicly available. To this extent, the information that could be obtained from the surroundings, and planned renewable energy developments were considered as part of the cumulative impact assessment. Fourteen (14) renewable energy projects were identified within a 35 km radius of the proposed development as shown in **Table 10.1** below. The renewable energy developments considered as part of this Transportation Study are as follows:

Table 10:1 Proposed Renewable Energy developments within a 35 km radius.

Applicant	Project	Technology	Capacity	Status of Application / Development
Verbena PV (Pty) Ltd	Verbena PV	Solar	120 MW	EIA Process underway
Hillardia PV (Pty) Ltd	Hillardia PV	Solar	120 MW	EIA Process underway
Themeda PV (Pty) Ltd	Themeda PV	Solar	120 MW	EIA Process underway
Aristida PV (Pty) Ltd	Aristida PV	Solar	120 MW	EIA Process underway
Euphorbia PV (Pty) Ltd	Euphorbia PV	Solar	120 MW	EIA Process underway
Abo Wind Lichtenburg 2 PV (Pty) Ltd	Lichtenburg 2 Solar Energy Facility	Solar	100 MW	Unknown
Biotherm Energy (Pty) Ltd	The 75MW Tlisitseng PV1 SEF	Solar	75 MW	Unknown
Barleria PV (Pty) LTD	Barleria PV	Solar	75 MW	Pending Decision
Dicoma PV (Pty) LTD	Dicoma PV	Solar	75 MW	Pending Decision
Setaria PV (Pty) LTD	Setaria PV	Solar	75 MW	Pending Decision
Abo Wind Lichtenburg 1 PV (Pty) Ltd	Lichtenburg 1 Solar PV	Solar ¹	100 MW	Unknown
Acsa PV	Bloemfontein Airport	Unknown	Unknown	Unknown
Hibernia Solar (Pty) Ltd	Hibernia Solar Energy Facility	Unknown	Unknown	Unknown
Megawatt One Photovoltaic (Pty) Ltd	Hibernia Solar Energy Facility	Unknown	Unknown	Unknown
Batloung Baga Shole Power Company	Unknown	Solar	64 MW	Unknown

The information obtained for other planned renewable energy developments in the surroundings is indicated in **Figure 10.1** below.

¹ The DFFE dataset indicates this project as onshore wind, however, in the technology status it is indicated as Solar PV. It is assumed that it is Solar PV.

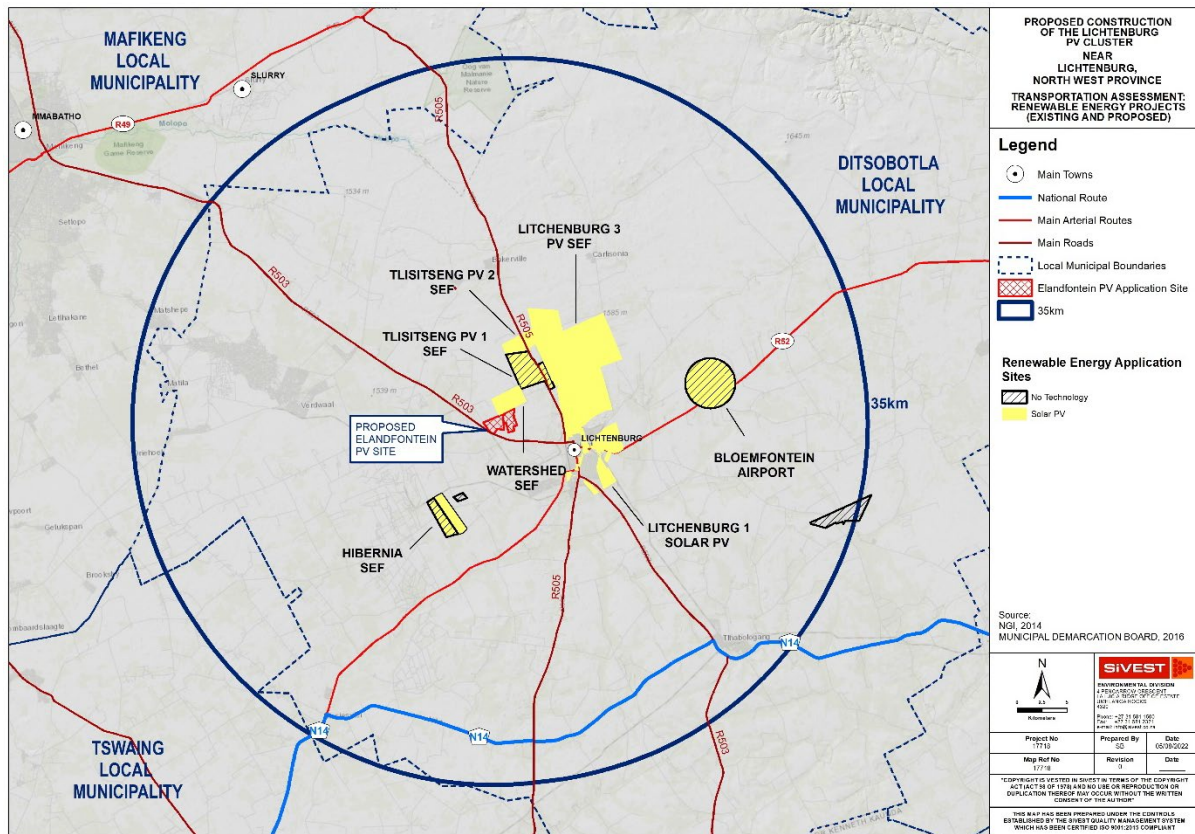


Figure 10.1 Proposed Renewable Energy Developments within a 35km radius

Based on the above, this Transportation Study has considered the cumulative impacts, which were further assessed in **Section 9** above.

11. COMPARATIVE ASSESSMENT OF ALTERNATIVES

No alternatives have been provided.

12. CONCLUSIONS AND IMPACT STATEMENT

The main objective of the 'Transportation Study' is to determine the impact/s the proposed Themeda PV Facility development will have on the immediate and greater area concerning transportation. The proposed development is located in a rural part of the North West Province, with the existing road network providing access to the development. Several other renewable energy developments have already been completed or are in the process of being completed in the immediate area.

The construction phase for this development will typically generate the highest number of additional vehicles. Of these additional vehicles, ± 23 trips / hour will occur in the morning and afternoon outside of the peak period, while ± 2 trips / hour will occur during the midday peak for construction material and abnormal loads. The impact will, however, be temporary and is considered to be nominal if adequately mitigated. During the operation phase, the facility will be expected to accommodate ± 50 employees and generate an additional ± 20 trips / day in the morning and afternoon peak period. This impact is considered to be nominal.

- In conclusion;
 - The proposed access point from Road P28-4 has a sufficient sight distance of > 350 m, is not located within and / or near any drainage lines,
 - Access upgrades on Road P28-4 will be required at the access point.

- Access road upgrades between the access position on Road P28-4 and the development will be required.
 - The access position upgrades on Road P28-4 require approval and a wayleave application from the North West Department of Public Works & Roads (NWDPR) before work commences.
 - Mitigation measures to be included in the construction phase:
 - As far as practically possible, ensure staff transport is done in the 'Off Peak' period and by bus to reduce impact in the peak periods.
 - Stagger material, component, and abnormal load deliveries.
 - According to the South African Road Traffic Sign Manual (SARTSM), Adequate road signage on all external roads carrying development traffic.
 - Reduction in the speed of vehicles.
 - Adequate enforcement of the law.
 - Implementation of pedestrian safety initiatives.
 - Regular maintenance of farm fences & access cattle grids.
 - Construction of gravel roads in terms of Technical Recommendations for Highways (TRH20).
 - Implement a road maintenance program under the auspices of the respective transport department; and
 - Possible use of approved dust suppressant techniques.
 - A more comprehensive route analysis should be completed before construction to better understand the works required and the potential risks.
 - No fatal flaws or preferences were identified for any proposed site alternatives, construction laydown areas, substation locations or Power line routes.
- Impact Statement;
 - Concerning this report, associated assessment and the findings made within, it is SiVEST's opinion that the Themeda PV and associated grid infrastructure will have a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective, provided the recommendations and mitigation measures in this report are implemented. Hence, Environmental Authorisation (EA) should be granted for the EIA application.

13. REFERENCES

KZN Transport – *Concrete Causeway Details (1996)*

South African National Roads Agency Limited – *Drainage Manual (5th Edition)*

American Association of State Highway Transportation Officials - *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400) (2001)*

Technical Recommendations for Highways (TRH11) – *Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads (7th Edition - 2000)*

Technical Recommendations for Highways (TRH17) – *Geometric Design of Rural Roads (1988)*

Technical Recommendations for Highways (DRAFT-TRH20) – *Unsealed Roads: Design, Construction and Maintenance (2013)*

Technical Recommendations for Highways (TRH26) – *South African Road Classification and Access Management Manual (2012)*

APPENDIX A: SPECIALIST CURRICULUM VITAE

CURRICULUM VITAE

Merchandt Le Maitre

Name	Merchandt Le Maitre
Profession	Civil Engineer
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Divisional Manager: Civil Engineering Division
Years with Firm	17 Years
Date of Birth	25 September 1982, Johannesburg, South Africa
ID Number	820925 5037 086
Nationality	South African



Education

- University of Johannesburg (2006)
- University of South Africa (2016)

Professional Qualifications

- N Dip: Civil Engineering
- B Tech: Civil Engineering (Water)
- Pr.Tech.Eng. (Reg. No. 2018300094)

Membership in Professional Societies

- Engineering Council of South Africa (ECSA) – Pr Tech Eng; (Reg N° 2018300094)
- South African Institute of Civil Engineers (SAICE)
- South African Wind Energy Associations (SAWEA)

Employment Record

Nov 2020 – present	SiVEST SA (PTY) LTD: Divisional Manager
May 2004 – Oct 2020	SiVEST SA (PTY) LTD: Senior Civil Engineering Technician
Jan 2004 – April 2004	Con Roux Zambia - Junior Foreman
Dec 2002 – Dec 2003	Neda Engineering - Vacation Work

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Fluent	Fluent	Fluent

Years of Working Experience: 17

Countries of Work Experience

- South Africa
- Swaziland
- Zambia
- Kenya
- Namibia

Fields of Expertise

- Bulk Services Studies
- Feasibility Studies
- Service Reports
- Infrastructure Design
- Contract Documentation & Procurement
- Contract Administration
- Procurement and Construction Monitoring

Overview

Merchandt joined SiVEST as a student Civil Engineering Technician in 2004 to which he received a company bursary to complete his studies and join the company permanently thereafter. Since joining permanently he has been actively involved in numerous township projects and associated infrastructure projects.

A summary of the experience in each field is indicated below:

Roads & Stormwater

Design, Implement & Contract Administration:

- Provincial Road Intersections (Class 2 Roads)
- Municipal Roads (Class 3-5 Roads)
- Residential & Industrial Township services
- Bulk Stormwater Infrastructure

Hydrology

- Attenuation Reports
- Flood Inundation Assessments / Floodline Reports
- Stormwater Management Reports
- Stormwater Assessments / Investigations
- Roof Gutter & Down Pipe Design / Assessments / Reports

Water & Sanitation

Design, Implement & Contract Administration:

- Water supply lines including Bulk Water
- Water pump stations
- Sanitation networks including Outfall Sewers
- Sewer pump stations
- Farm Irrigation Network

Renewable Energy

- Transportation Impact Assessments
- Water Demand Assessments
- Glint & Glare Assessments
- Stormwater Management Reports

- Preliminary Engineering Reports & Designs

Projects Experience (by Sector)

TOWNSHIP SERVICES

- Tijger Valley Extension 10, 20, 21, 22, 23, 27, 38-44, 72, 105-113, 19, 62, 103, 104, 34, 35, 36, 123 etc. - Design, Procurement, Contract Administration and Monitoring.
- Derdepoort Extension 181- Design, Procurement, Contract Administration and Monitoring.
- Project Springbok, Sasolburg - Design, Procurement, Contract Administration and Monitoring.
- Arcadia Extension 11 - Design, Procurement, Contract Administration and Monitoring.
- Lakeside Erf 181- Design, Procurement, Contract Administration and Monitoring.
- Longmeadow Extension 10, 11 & 12 - Design, Procurement, Contract Administration and Monitoring.
- Bushwillow Estate - Design, Procurement, Contract Administration and Monitoring.
- Forum Homini – Draughting Monitoring of Dam Spillway construction & sewer reticulation.
- Longmeadow Extension 7, 8, 9, 10, 11, 12 – Township services and design of earth retaining wall.
- Lakeside Erf 181 – Design and supervision of Township Services including Attenuation facilities.
- Mbabane Kingdom Hall – Bulk earthworks and road Design, Procurement, Contract Administration and Monitoring.
- Kungwini Bulk Water – Draughting and supervision of a Steel Bulk Water Supply Pipe.
- Mooikloof Booster Station – Design and supervision of a water booster pump facility..
- PTN 2 of 148 Athol – Compiling and analysis Stormwater Assessment.
- Mooibosch Development – Compiling of Services reports and Floodline Determination.
- Hazeldean Extension 39 – Design and supervision of Township Services.
- Hazeldean Retirement – Design of Township Services.
- Kungwini Collector Sewer – Design of Collector Sewer.
- Maroeladal Extension 9 – Design and compilation of Services Report.
- Hazeldean Oukraal – Design of Township Services
- Hazeldean Business Park – Design and compilation of Services Reports.
- Erf 181 Derdepoort – Design and compilation of Services Reports and preliminary design of Provincial Intersection.
- Erf 92 Edenburg – Floodline Determination and design and compilation of the Services reports.
- Longmeadow Extension 12 Stormwater – Design of Stormwater Reticulation.
- Astral Foods - Design, Procurement, Contract Administration and Monitoring of civil services.
- Eastgate Solar Roof – Glint & Glare Assessment
- Cotton Gin Mpumalanga – Design & Procure all services

ROADS & INTERSECTION DESIGN

- D631 Intersection – Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- D36 Intersection & Road Widening - Design, Wayleave Approval, Procurement.
- K34 Intersection – Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- K101 Intersection – Design, Wayleave Approval.
- Justice Mahomed, University, Walton Jameson Rd Intersection – Design, Wayleave Approval.
- Cedar Road West – Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- Brikor – Design of New Intersection.
- New Zealand Embassy – Design of Intersection.
- East Point Game - Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.

HYDROLOGY AND STORMWATER

- Hazeldean Floodline - Data collection, Flood determination and compilation.

CURRICULUM VITAE

Merchandt Le Maitre

- Gautrain Railway Stormwater Management – Design and compile stormwater management and attenuation facilities.
- Stormwater Modelling for Project Springbok – Attenuation of hazardous material in stormwater system.
- Sappi Ngodwana Floodline – Data collection, Flood determination and compilation. This floodline included cognisance of the Ngodwana dam.
- Irene Mall Stormwater Management - Accommodation of the Post Development stormwater flow through an existing township / suburb.
- Loftus Park Stormwater Management – Accommodation of the Post Development stormwater flow through an existing township / suburb.
- Pienaars River Floodline Modelling – Modelling of the river through two future Class 1 & 3 road bridge structures.
- Renewable Energy Stormwater Management – A number of Management Plans for the Renewable Energy sector has been completed.
- Longmeadow Extension 10 (Pick & Pay) – Design and compilation of Stormwater Management report.
- Erf 4173 Peter Place – Floodline Determination.
- Irene Mall Township – Design of Township Services and Stormwater Management.
- Mitsubishi McCarthy Midrand – Design and compilation of Stormwater Management report.
- Isago @ N12 – Floodline Determination.
- Innoland – Floodline Determination.
- Lot 204 Edenburg – Floodline Determination
- Erf 90 Douglasdale – Floodline Determination.
- PTN 35 Houtkoppen – Floodline Determination.
- Erf 4173 Peter Place – Floodline Determination.
- Hyde Close Floodline – Floodline Determination.
- Chartwell Floodline – Floodline Determination
- Hyundai East Rand – Roof Gutter & Down Pipe design
- Oilifants River – Floodline Determination

WATER TRANSFER / RETICULATION AND SANITATION COLLECTORS / OUTFALLS

- Bojanala Platinum District Municipality – Water & Sanitation Bulk Master Planning.
- Hazeldean Development – Bulk Water Supply & Collector Sewer Design, Procurement, Contract Administration and Monitoring.
- Mamba Kingdom – Bulk Water Analysis.
- Lesedi Local Municipality Bulk Water - Design, Wayleave Approval, Procurement, Contract Administration and Monitoring.
- NEF Tomato Paste Project – Design of Farm Irrigation Network

RENEWABLE ENERGY

- Dyansons Klip 5 – Stormwater Management Report
- De Aar Solar – Stormwater Management Report
- Droogfontein Solar – Stormwater Management Report
- Mierdam Solar – Stormwater Management Report
- Prieska– Stormwater Management Report
- Hoekplaas – Stormwater Management Report
- Noupoort WEF – Stormwater Management Report
- Copperton PV – Stormwater Management Report
- Klipgats PV – Stormwater Management Report
- Tooverberg Wind Energy Facility – Transportation Impact Assessment & Water Demand Assessment
- Umsobomvu Solar Energy - Transportation Impact Assessment
- Prieska Solar Energy - Transportation Impact Assessment Amendment
- Droogfontein Solar Energy - Transportation Impact Assessment Amendment

CURRICULUM VITAE

Merchandt Le Maitre

- Loeriesfontein Solar Energy - Transportation Impact Assessment Amendment
- Koeris WEF - Transportation Impact Assessment Amendment
- East Gate Shopping Centre - Glint & Glare Assessment
- Oya Energy - Glint & Glare Assessment
- Yemaya – Glint & Glare Assessment
- Beaufort West WEF – Preliminary Engineering Design
- Heuweltjies WEF – Transportation Study
- Kraaltjies WEF – Transportation Study
- Koup 1 & 2 – Transportation Study
- Grootegeluk Solar Project – Transportation Study
- Renewstable Swakopmund – Glint & Glare Assessment
- Several projects are Confidential as they are not yet in the public domain and hence have not been included in the list above.

OTHER

- Project Springbok – Design of Services and Railway Siding.
- Phalaborwa Mining Company – Preliminary Design of Bulk Water feed and Railway Line.
- Kansanshi Copper Mine, Zambia – Junior Site Foreman.
- Final QC for Sasol Secunda.
- NDT testing – MMC Nelspruit, Global Forest Products Sabie.
- Boiler inspections and preliminary design – MMC Nelspruit, Global Forest Products, TSB Malelane.

Computer Skills

- AutoCAD Civil 3D
- AutoCAD Storm and Sanitary Analysis
- Microsoft Office
- Microsoft Project
- TechnoCAD
 - Surfmate
 - Roadmate
 - Pipemate
 - Watermate
- AutoTURN (Vehicle Turning Simulation Software)
- RiverCAD
- HecRAS
 - 1D Flood Modelling
 - 2D Flood Modelling

A handwritten signature in black ink, appearing to read "W. Maitre".

APPENDIX B: SPECIALIST DECLARATION



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

PROPOSED THEMEDA PV IN THE NORTH WEST PROVINCE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SIVEST SA (PTY) LTD			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement recognition	100%
Specialist name:	MERCHANT LE MAITRE			
Specialist Qualifications:	B TECH – CIVIL ENGINEER			
Professional affiliation/registration:	ECSA (PR TECH ENG No: 2018300094)			
Physical address:	LOFTUS PARK, BUILDING A, 5 TH FLOOR, 416 KIRKNESS STR, ARCADIA, PRETORIA			
Postal address:	PO BOX 2921, RIVONIA			
Postal code:	2128	Cell:	072 435 8497	
Telephone:	011 798 0600	Fax:	011 803 7272	
E-mail:	MERCHANTM@SIVEST.CO.ZA			

2. DECLARATION BY THE SPECIALIST

I, MERCHANT LE MAITRE, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

SIVEST SA (PTY) LTD

Name of Company:

12TH JULY 2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, MERCHANDT LE MAITRE, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



Signature of the Specialist

SIVEST SA(PTY) LTD

Name of Company

11TH JULY 2022

Date

Signature of the Commissioner of Oaths

Date



SiVEST Civil Engineering Division

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