



CEN INTEGRATED ENVIRONMENTAL MANAGEMENT UNIT

Environmental and Rural Development Specialist

DRAFT **FINAL ENVIRONMENTAL MANAGEMENT**

PROGRAMME

PROPOSED SACE RANGER SOLAR PV (2.46MW) PLANT,

UITENHAGE, EASTERN CAPE

DEA REFERENCE NO: 14/12/16/3/3/1/1172

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Chapter 1: Introduction to the Environmental Management Programme

1.1 Background

CEN Integrated Environmental Management Unit (CEN IEM Unit) was appointed by South African Clean Energy Solutions (SACE) to undertake the environmental assessment for the Proposed SACE Ranger Solar PV (2.46MW) Plant, Uitenhage, Eastern Cape.

The purpose of this document is to provide a framework for the management of environmental impacts associated with the SACE Ranger Solar PV (2.46MW) Plant located on Portion 3 of the Farm Bauwerskraal, No 234, Uitenhage situated within the Nelson Mandela Bay Municipality, Eastern Cape.

This Environmental Management Programme (EMPr) is a framework Programme and does not provide specific management plans detailing how management actions are to be implemented, but rather is structured around a number of activities and identifies where more detailed Method Statements should be developed by the contractors and the subcontractors respectively.

The EMPr also identifies and clarifies the roles and responsibilities of key role-players in the implementation of the specific requirements of the EMPr as well as in monitoring, reporting, auditing and review requirements which are components of the construction phase environmental management system.

1.2 Environmental Assessments Undertaken for the Development

A Basic Assessment was done for the proposed SACE Ranger Solar PV (2.46MW) Plant under the EIA Regulations (2010). This EMPr has been drafted during the Basic Assessment phase and includes the mitigation measures recommended in the Basic Assessment Report.

1.3 Details of the Authors

The details and expertise of the persons who prepared the EMPr are provided below, as per the requirements of the EIA Regulations, 2010.

The reports were prepared by Mrs Lucille Behrens. Lucille has 10 years of experience in the environmental management field, has a B.Sc. Honours in Environmental Monitoring and Modelling, and is a member of IAIAAsa. Her area of expertise is EIAs and related processes, and as project manager.

All reports are reviewed and approved by Dr Mike Cohen, Director at CEN IEM Unit and the project-specific EAP. Mike has over 30 years of experience, has a D.Sc. in Wildlife Management, is a registered Professional Natural Scientist (PrSciNat), a member of IAIAAsa and Institute of Ecologists and Environmental Scientists.

1.4 Methodology

A number of steps are essential in order to ensure that environmental damage will be minimised or eliminated:

1. Potential impacts must be identified and their significance assessed.
2. Suitable mitigation measures need to be defined.
3. A system to ensure that the necessary mitigation is being implemented must be established.
4. The effectiveness of the management must be monitored.
5. The Project Manager, Resident Engineer, Environmental Control Officer and the representatives of the developer must be in a position to verify the work undertaken and to monitor the environmental management process.

The purpose of this EMPr is to describe:

1. How adverse environmental impacts will be managed;
2. How environmental damage or degradation will be mitigated;
3. How site rehabilitation will be undertaken; and
4. What monitoring is necessary to ensure that the above measures are successful.

The EMPr should be viewed as a dynamic document, which may require updating and / or revision during the operation and decommissioning of the project.

1.5 Purpose and Scope of the Environmental Management Programme

This EMPr deals with the planning and design, construction, rehabilitation and operational phases of the SACE Ranger Solar PV (2.46MW) Plant.

The EMPr is intended primarily as a management tool for the developer and contractors who will be appointed to undertake the required work, to ensure that environmentally acceptable practices are followed during all phases of the project.

The EMPr outlines structures and procedures to be employed by the Developer, Resident Engineer and the contractors. It is aimed at minimising and managing environmental impacts during the construction and operational phases of the project. The specific aims of the EMPr are to:

1. Formulate procedures to rectify impacts created through the construction and to minimise any additional potential secondary environmental impacts.
2. Suggest methods to ensure compliance with the EMPr, including record keeping.

The successful implementation of this EMPr is dependent on its forming part of the project's management system. Without regular checks on performance and corrections of deviations from the environmental objectives, procedures and targets, the EMPr will fall into disuse and become ineffective. The EMPr, therefore, includes various elements of an Environmental Management System such as objectives and targets, the allocation of responsibilities, checking of corrective action, regular audits, and management review of the system.

1.5.1 For Whom is the Programme Intended?

The EMPr is a management tool and will be used primarily by the Developer, Project Manager, Resident Engineer and the Contractors responsible for the onsite work.

It is recommended that this EMPr is kept on-site at all times and should be available to the public upon request.

1.6 Structure of this Environmental Management Programme

Chapter 1 of this EMPr serves to introduce the scope of the EMPr and the constraints of the project. The purpose of the EMPr is also explained. The EMPr is designed for use by the Developer, Project Manager, Resident Engineer and Contractors to rectify any adverse environmental impact associated with the project.

Chapter 2 identifies the land in question and presents application details. The environment, which will be affected by the development, was fully described in the environmental assessment report and is not repeated in this report.

Chapter 3 briefly discusses environmental policy. It presents a suggested organisational structure for the project to ensure that responsibilities are allocated and that there is adequate control over the work.

Chapter 4 recommends general environmental management requirements - with specific objectives and targets - which apply to all stages and elements of the construction process and rehabilitation process.

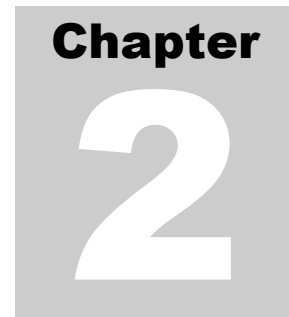
Chapter 5 presents elements of the Environmental Management System designed to facilitate the implementation, management and regular audit of the EMPr.

A Glossary of Terms is presented in **Chapter 6**.

Table 1 presents a cross reference to the information requirements per Regulation 33 of Government Notice R.543 (of 18 June 2010, NEMA EIA Regulations).

➤ **Table 1: Information Requirements per Regulation 33 of GN R.543**

| Description | GN R543 Regulation 33 | Chapter in EMPr |
|---|-------------------------------|------------------|
| Details and expertise of the person preparing the EMPr. | 33 (a) | Chapter 1 |
| Detailed description of the aspects of the activity. | 33 (c) | Chapter 2 |
| Identification of persons responsible for implementation of measures. | 33 (d) | Chapter 3 |
| Proposed management or mitigation measures to address the environmental impacts in respect of the various project phases, including measures to rehabilitate the environment affected. Time periods within which the measures must be implemented. | 33 (b), (f), (g), (h) and (i) | Chapter 4 |
| Proposed mechanism for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon. Environmental awareness training | 33 (e), (j) | Chapter 5 |
| Closure plans, including closure objectives, where appropriate. | 33 (k) | N/A |

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Chapter 2: Description of Project and Environmental Management Issue

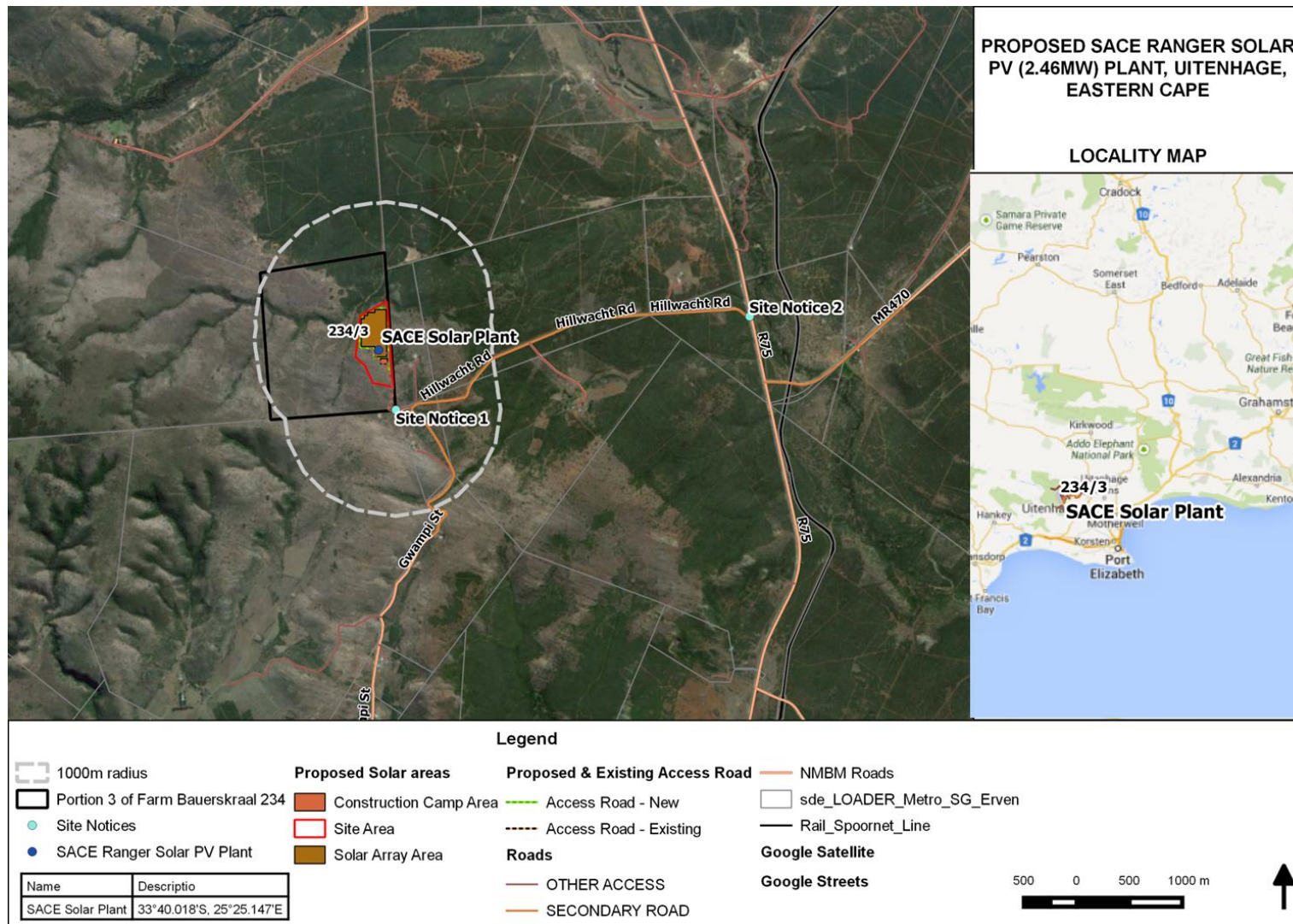
The following section identifies the land in question. The environment, which will be affected by the development, was fully described in the environmental assessment report and is not repeated here.

2.1 Project Location

The proposed solar plant, the SACE Ranger Solar PV Plant, will be located on Portion 3 of the Farm Bauwerskraal, No 234, Ward 53, Uitenhage situated within the Nelson Mandela Bay Municipality, Eastern Cape. The 21 digit Surveyor General code for the property is C0760000000023400003. The site is approximately 7km north of the urban area of Uitenhage.

The total project site is approximately 19.2 ha in extent, and within this area approximately 9.5 ha will be used for the solar array area (footprint area) and 0.3 ha for the construction camp area. Refer to the locality map, **Figure 1** and layout map, **Figure 2**.

The site is accessed from a gravel road, the Hillwacht Road (DR01940), which links to the R75 (Uitenhage Road).



➤ **Figure 1: Locality Map**

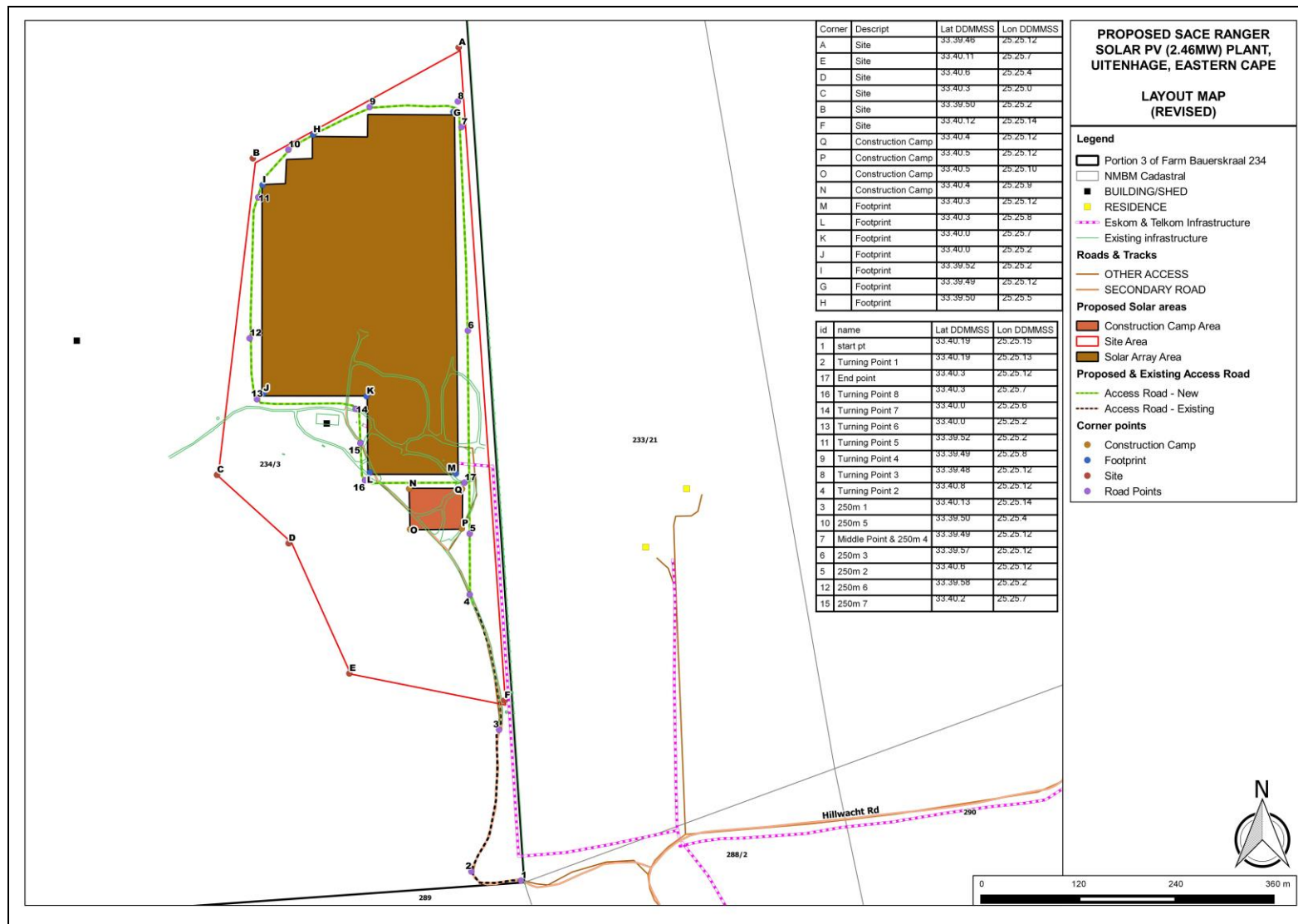


Figure 2: Layout Map (Revised)

2.2 Project Description (Application)

South African Clean Energy Solutions (SACE) are proposing the development of a small scale, pilot solar (photovoltaic, PV) plant, in order to generate 2.46MW net capacity of electricity. The proposed solar production entails a solar panel tracker mounting system, 1000V DC PV system and 11kV distribution system and transmission / distribution line to connect to the existing transmission / distribution line.

The proposed solar plant will convert sunlight into electricity, through photovoltaics (PV). Photovoltaics convert light into electric current. Solar cells produce direct current (DC) power which fluctuates with the sunlight's intensity. For practical use this usually requires conversion to certain desired voltages or alternating current (AC), through the use of inverters. Multiple solar cells are connected inside modules. Modules are wired together to form arrays (rows), then tied to an inverter, which produces power at the desired voltage, and for AC, the desired frequency/phase.

The solar tracking system would consist of a single axis PV system. The system is a simplified mechanical structure with pre-assembled components. The system mounting components are able to withstand changes in topography and settling.

The solar panels or PV modules consists of thin film solar module technology, certified for use in 1000V DC systems. The PV modules are manufactured off-site, and certified for reliability and safety by international institutes. Each PV module is approximately 1200mm by 600mm in size and will be positioned in rows to form the solar array area. The operational lifespan is approximately 25 years. The solar panels will be positioned approximately 0.5m above ground level.

2.3 Legislative Framework

The proposed SACE Ranger Solar PV (2.46MW) Plant includes activities that may have a detrimental effect on the environment as listed in GN R.544 and GN R.546 (Government Gazette 33306 of 18 June 2010, as amended). The process to be followed in the application for an Environmental Authorisation regarding the relevant activities is a Basic Assessment process, as described in the EIA Regulations, 2010, published in terms of Section 24(5) of the NEMA. The proposed SACE Ranger Solar PV (2.46MW) Plant may not commence without an Environmental Authorisation from the DEDEAT.

➤ **Table 2: EIA Listed Activities**

| Listed activity as described in GN R.544, 545 and 546 | Description of project activity |
|--|---|
| GN R.544 Item 1: The construction of facilities or infrastructure for the generation of electricity where: (ii) the output is 10 megawatts or less but | The construction of a solar (photovoltaic, PV) plant, with a 2.46MW net capacity, and 11kV distribution and transmission. |

| Listed activity as described in GN R.544, 545 and 546 | Description of project activity |
|--|---|
| the total extent of the facility covers an area in excess of 1 hectare. | The solar array footprint area is 9.5 ha in extent. |
| GN R.544 Item 22: The construction of a road, outside urban areas, (ii) where no reserve exists where the road is wider than 8 metres. | <p>The proposed site is located outside an urban area, however the road width will be less than 8m.</p> <p>Approximately 400m of the existing access road will be widened by 2 to 3m.</p> <p>The existing access road will be lengthened by approximately 1600m, with a width of 3 to 4m, around the proposed solar plant.</p> <p>The access road will be a gravel road.</p> |
| GN R.544 Item 23(ii): The transformation of undeveloped, vacant or derelict land to (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 ha. | The project site is located outside an urban area, to be rezoned from agriculture and is approximately 19.2 ha in extent. The solar array area is 9.5ha in extent. |
| GN R.544 Item 47: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (i) where the existing reserve is wider than 13,5 metres; or (ii) where no road reserve exists, where the existing road is wider than 8 meters. | Approximately 400m of the existing access road will be widened by 2 to 3m. The existing access road will be lengthened by approximately 1600m, with a width of 3 to 4m, around the proposed solar plant. |
| <p>GN R.546 Item 4(a)(ii): The construction of a road wider than 4 metres with a reserve less than 13,5 metres. Within the (a) Eastern Cape, (ii) outside urban areas, in:</p> <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(gg) Areas ... within 5 kilometres from any other protected area identified in terms of NEMPAA.</p> | <p>Approximately 400m of the existing access road will be widened by 2 to 3m. The existing access road will be lengthened by approximately 1600m, with a width of 3 to 4m, around the proposed solar plant. The access road will be a gravel road.</p> <p>The site is located within a CBA2 area of the Eastern Cape Biodiversity Conservation Plan (ECBCP) and is located within 5km of The Springs Local Authority Nature Reserve.</p> <p>The site does not fall within a CBA of the NMBM Bioregional Plan.</p> |
| GN R.546 Item 12(b): The clearance of an area of 300 square meters or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (b) Within critical biodiversity areas identified in bioregional plans. | <p>The site is located within a CBA2 area of the ECBCP. The site does not fall within a CBA of the NMBM Bioregional Plan.</p> <p>An area of approximately 10ha will be cleared of vegetation for the solar array area and construction camp.</p> |
| GN R.546 Item 13(a)&(c): The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes | The site is located within a CBA2 area of the ECBCP and located within 5km of The Springs Local Authority Nature Reserve. |

| Listed activity as described in GN R.544, 545 and 546 | Description of project activity |
|---|--|
| <p>indigenous vegetation.</p> <p>(a) Critical biodiversity areas as identified in systematic bioregional plans adopted by the competent authority.</p> <p>(c) Eastern Cape, (ii) Outside urban areas in:</p> <p>(ff) Areas ... within 5 kilometres from any other protected area identified in terms of NEMPAA.</p> | <p>The site does not fall within a CBA of the NMBM Bioregional Plan. An area of approximately 10ha will be cleared of vegetation for the solar array area and construction camp.</p> |
| <p>GN R.546 Item 14(a)(i): The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.</p> <p>(a) Eastern Cape, (i) All areas outside urban areas</p> | <p>The site is located outside an urban area and an area of approximately 10ha will be cleared of vegetation for the solar array area and construction camp.</p> |
| <p>GN R.546 Item 19(a)(ii): The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</p> <p>(a) Eastern Cape, (ii) outside urban areas, in:</p> <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(gg) Areas ... within 5 kilometres from any other protected area identified in terms of NEMPAA.</p> <p>(ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined.</p> | <p>Approximately 400m of the existing access road will be widened by 2 to 3m. The existing access road will be lengthened by approximately 1600m, with a width of 3 to 4m, around the proposed solar plant. The access road will be a gravel road.</p> <p>The site is located within a CBA2 area of the ECBCP and is located within 5km of The Springs Local Authority Nature Reserve. The site does not fall within a CBA of the NMBM Bioregional Plan. A drainage line is located within 100m of the proposed access road.</p> |

2.4 Summary of Impacts

Potential impacts that are associated with the proposed SACE Ranger Solar PV (2.46MW) Plant were identified, assessed and are summarised in **Table 3**.

➤ **Table 3: Summary of Impacts**

| SUMMARY OF IMPACTS & SIGNIFICANCE | | | | |
|---|---------------------------|--------------------------|-------------|------------|
| Phase | Alternative 1 (Preferred) | | | No Go |
| | Planning & Design | Construction & Decommis. | Operational | |
| Ecological : Loss of vegetation | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Medium (+) |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Medium (+) |
| Ecological : Loss of habitat containing Species of Special Concern | | | | |
| Significance before mitigation | High (-) | High (-) | High (-) | Medium (-) |
| Significance after mitigation | Medium (-) | Medium (-) | Medium (-) | Medium (-) |

| SUMMARY OF IMPACTS & SIGNIFICANCE | | | | |
|--|---------------------------|--------------------------|----------------|--------------|
| Phase | Alternative 1 (Preferred) | | | No Go |
| | Planning & Design | Construction & Decommis. | Operational | |
| Ecological : Potential spread of alien vegetation | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Medium (-) |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Low (-) |
| Ecological : Changes to the hydrological systems | | | | |
| Significance before mitigation | Medium (-) | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Very low (-) | Very low (-) | Very low (-) | Neutral |
| Ecological : Pollution of soils, surface and groundwater | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Ecological : Disturbance to Fauna and Avifauna | | | | |
| Significance before mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Air Quality : Dust and Air Pollution | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Medium (-) |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Very Low (-) |
| Heritage Resources : Loss of heritage resources | | | | |
| Significance before mitigation | Neutral | Low (-) | Neutral | Low (-) |
| Significance after mitigation | Neutral | Very Low (-) | Neutral | Low (-) |
| Land Use : Loss of agricultural land | | | | |
| Significance before mitigation | Neutral | Neutral | Medium (-) | Medium (-) |
| Significance after mitigation | Neutral | Neutral | Medium (-) | Low (+) |
| Land Use : Soil erosion | | | | |
| Significance before mitigation | Medium (-) | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Low (-) | Low (-) | Low (-) | Neutral |
| Waste Management : Liquid and solid waste, vermin control | | | | |
| Significance before mitigation | Medium (-) | Medium (-) | Medium (-) | Medium (-) |
| Significance after mitigation | Low (+) | Low (-) | Low (-) | Low (+) |
| Traffic : Increased traffic in greater area | | | | |
| Significance before mitigation | Neutral | Medium (-) | Low Medium (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Traffic : Traffic safety impact due to additional traffic | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Traffic : Deterioration of public road network | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |

| SUMMARY OF IMPACTS & SIGNIFICANCE | | | | |
|---|---------------------------|--------------------------|-------------|------------|
| Phase | Alternative 1 (Preferred) | | | No Go |
| | Planning & Design | Construction & Decommis. | Operational | |
| Social : Noise pollution | | | | |
| Significance before mitigation | Neutral | Medium (-) | Low (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Social : Visual Intrusion | | | | |
| Significance before mitigation | Neutral | Medium (-) | High (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Social : Health, safety and security | | | | |
| Significance before mitigation | Neutral | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Neutral | Low (-) | Low (-) | Neutral |
| Social : Employment Opportunities | | | | |
| Significance before mitigation | Neutral | Medium (+) | Medium (+) | Medium (-) |
| Significance after mitigation | Neutral | Medium (+) | Medium (+) | Medium (-) |
| Social : Reduction in property values | | | | |
| Significance before mitigation | Neutral | Neutral | Low (-) | Neutral |
| Significance after mitigation | Neutral | Neutral | Low (-) | Neutral |
| Social : Existing Services and Infrastructure | | | | |
| Significance before mitigation | Medium (-) | Medium (-) | Medium (-) | Neutral |
| Significance after mitigation | Low (-) | Low (-) | Low (-) | Neutral |
| Renewable Energy Infrastructure : Production of cleaner energy | | | | |
| Significance before mitigation | Neutral | Neutral | Medium (+) | Medium (-) |
| Significance after mitigation | Neutral | Neutral | High (+) | Medium (-) |

2.5 Construction and Operational Activities

Construction Phase

The construction phase will be undertaken in three (3) phases:

Phase 1: Preparation of the site for construction, surveying and mapping the foundation points with GPS co-ordinates, on-site secured storage facilities, mansheds (i.e. eating facilities) and toilets. Clearing of site of vegetation. Areas that may require clearing include solar array area, trenches for cabling, construction and laydown areas in order to undertake the required construction.

Phase 2: Construction of all civil activities. This phase includes lengthening and widening of the access road, trenching for cables, setting racking foundations, mounting PV panels to each new row of standing racks, installing the inverters to the racks, stringing the panels, pulling the cables, and ends with completing all the PV plant electrical works.

Phase 3: Testing and commissioning of equipment. The PV plant's performance is measured, review of as-built plans. Detected failures will be repaired prior to issuing the provision acceptance certificate (PAC).

Operation and Maintenance Phase

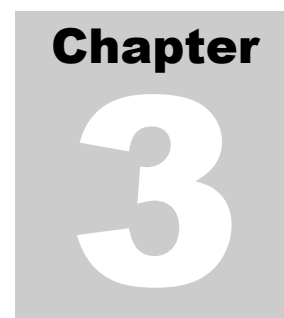
Monitoring, inspections and regular maintenance of solar equipment. A data collection system is used to monitor the functioning of the tracking system.

Reactive repairs – measures are taken to restore the operation and safety of solar park immediately after becoming aware they have been affected by a malfunction.

Ground maintenance includes trimming (mowing or cutting) of vegetation to avoid shading (i.e. shadows) or affecting operations (e.g. creating barriers). Pathways (approximately 5m in width) between arrays are left unobstructed, ensuring maintenance staff have access to all portions of each array. Shrubs and trees immediately adjacent to the solar panels will also be physically cut in order to prevent shadows being cast onto the panels.

Once the solar farm is operational, it is assumed that a maximum of two vehicle trips will arrive on site during the AM peak hour and depart during the PM peak hour.

No chemical cleaning agents are utilised during the operational phase. The solar panels are cleaned with water and sponges.

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Chapter 3: Organisational Requirements

3.1 Introduction

The Developer and their appointed Project Managers must make the Resident Engineer and Contractors aware of their environmental objectives and policy.

3.2 Background to Environmental Policy

An environmental policy is a statement of the environmental values of an organisation. It conveys these environmental values to employees, demonstrates to stakeholders the importance that senior management attaches to environmental protection and management, and provides a guiding framework for conducting the organisation's business in an environmentally compatible manner.

The philosophy behind the EMPr is for it to become an effective means of managing environmental performance by:

1. Enabling the identification of critical environmental issues;
2. Developing action plans and setting targets;
3. Ensuring environmental performance;
4. Raising environmental awareness among management, staff and the community which it serves; and,
5. Providing appropriate training.

3.3 Organisational Overview

Managers should be familiar with the requirements of the EMPr and should execute all construction, decommissioning and maintenance activities in an environmentally responsible manner.

This overview offers a perspective of the proposed organisation of the EMPr and the recommended responsibilities of key members of the project team. Ultimate responsibility and public accountability for the EMPr and the general environmental management during the construction phase resides with the Developer.

The Contractors are responsible for implementing and managing the EMPr during the construction phase. It is recommended that the Contractors appoint a member of their team as the Contractor's Environmental Officer who is responsible for ensuring that the requirements of the EMPr are implemented on a day to day basis. The Contractors report to the Resident Engineer or his representative regarding compliance with the conditions as stipulated in the EMPr. The Resident Engineer or his representative works through the Environmental Control Officer to assist with environmental management.

An Environmental Control Officer (ECO) is appointed by the Developer (through the Resident Engineer or his representative) to assist and advise on the implementation of the EMPr. The ECO is to conduct monthly audits and must be available for discussion.

Where procedures in the EMPr and methods delineated in the Method Statements are persistently transgressed and appropriate corrective action is not implemented, the ECO through the Resident Engineer or his representative may order the suspension of related activities or impose a fine on the transgressor.

Regular meetings should be held to ensure that the EMPr is effectively implemented.

3.4 Roles and Responsibilities for the Implementation of the Environmental Management Programme

This section defines the roles of the key parties involved in the implementation of the EMPr for the SACE Ranger Solar PV (2.46MW) Plant and mitigation measures presented in the Basic Assessment Report relevant to the various phases of the development.

3.4.1 South African Clean Energy Solutions (The Developer)

The Developer, as the project initiator, has the overall accountability and responsibility for environmental management during the design, construction and operational phases of the SACE Ranger Solar PV (2.46MW) Plant. Further it is their responsibility to ensure that the conditions of the Environmental Authorisation and mitigation measures presented in the Basic Assessment Report are communicated to, implemented and complied with by the project managers, contractors and sub-contractors.

The EMPr forms part of tender documentation to the Contractor and becomes legally binding on the Contractor and anyone acting on behalf of the Contractor or the Developer during construction, operation and decommissioning activities.

While it is the responsibility of the Contractors and the sub-contractors to prepare and implement the detailed Method Statements, the Developer will remain accountable for their implementation.

The Developer (and not the Resident Engineer or the contractors) will be responsible for liaison with the relevant authorities with respect to the implementation of the Environmental Authorisation and the EMPr.

With respect to the EMPr, the Developer is responsible for:

1. Liaising with the project engineer and contractors, to ensure that all components of the development are designed to meet all the listed environmental conditions as well as all of the legal requirements.
2. Reviewing the Method Statements prepared by project engineers, the contractors and sub-contractors for specific activities relating to the construction phase.
3. Reviewing and approving management plans prepared by the project engineers, contractors and sub-contractors.
4. An Environmental Control Officer (ECO) is to be appointed, whose primary role shall be to coordinate the environmental management activities during the construction phase of the development.
5. Reviewing and approving any environmental monitoring programmes that are recommended by the ECO or the authorities.
6. Advising on actions to be taken in the event of incidents or public complaints.
7. Providing the results of environmental reports to the relevant authority.

Ensuring that the required audits are undertaken on a timely basis and that the results of the audits are communicated to all operation personnel.

3.4.2 Authorities

The authorities are responsible for the timely processing and issuing of the necessary permits and authorisations for the SACE Ranger Solar PV (2.46MW) Plant. The authorities will ensure that the Developer complies with the terms that are stipulated within the Environmental Authorisation (should one be issued). Where necessary, the authorities will assist the Developer in understanding and meeting the specified requirements.

The authorities may perform random controls to ensure compliance with the conditions. In such case, the Developer will assist the authorities in every possible way so as to facilitate the control. In case of long-term non-compliance, the Developer will be required to provide an action plan with corrective measures for approval by the authorities.

3.4.3 Resident Engineer

All obligations relevant to the Developer concerning the implementation of the EMPr, will apply to the Resident Engineer or his representative, contractors and sub -contractors associated with the construction phase of the SACE Ranger Solar PV (2.46MW) Plant. The Developer will inform the Resident Engineer or his representative of these obligations, as well as of the Method Statements required in terms of these obligations, and will control their implementation. The Resident Engineer or his representative is to convey the requirements of the EMPr to the contractors and their sub-contractors; and ensure that they comply with these obligations.

The Resident Engineer is to ensure that the EMPr forms part of the tender documentation to the Contractor and becomes legally binding on the Contractor and anyone acting on behalf of the Contractor during construction.

It is the responsibility of the project engineers, contractors and sub -contractors to prepare and implement Method Statements which detail the means they will employ in order to meet the objectives set in the EMPr.

The contractors and sub-contractors will be required, where specified, to provide Method Statements to the Resident Engineer or his representative setting out in detail how the management actions will be implemented in order to ensure that the environmental management objectives will be achieved.

The Resident Engineer or his representative working in close cooperation with the ECO ensures that the EMPr is implemented. The Resident Engineer or his representative is the direct link between the ECO and the Contractors and sub-contractors.

Specific responsibilities include:

1. Distribution of copies of the EMPr to the project team.
2. Advising the Developer on the appointment of any specialist if required.
3. Attending Project Progress Meetings, where the performance of the EMPr is discussed and / or reviewed.
4. Commission of monitoring programme recommended by the ECO.
5. Ensuring that measures are taken to address any problems in the implementation of the EMPr.
6. Briefing the contractors regarding their EMPr responsibilities and ensure that they implement the conditions of the EMPr.
7. Formalising systems and delegating authority to ensure that the EMPr is effectively implemented.

8. Regular site inspections and monitoring to ensure compliance with the prescribed procedures in the EMPr.
9. Devising a Corrective Action Procedure for implementing corrective and preventive action.
10. Regular consultation with the ECO, as appropriate.
11. Facilitating the implementation of a general and specific environmental awareness training programme.
12. Devising a system to evaluate the training programme regularly and recommend changes as required.
13. The creation, in consultation with the ECO, of a Method Statement pro-forma, for distribution to the appropriate contractors and their sub-contractors.
14. The examination, revision and approval, of contractors Method Statements.
15. Keeping records of waste disposal, audits, inspections, monitoring and corrective actions.
16. Ensuring that copies of the EMPr are available to all contractors and sub-contractors.
17. Identification of any new significant environmental impacts and their associated aspects, and the necessary environmental management requirements to manage them.
18. Organising audits on the implementation of the EMPr.

3.4.4 Contractors and Sub-Contractors

The Contractor/s and sub-contractors have final responsibility and are accountable to the Developer for the effective implementation and monitoring of the EMPr.

The Contractor and sub-contractors are responsible to the Resident Engineer or his representative for the effective implementation of the EMPr within their respective line functions.

Specific responsibilities include:

1. Appointing a Contractor's Environmental Officer who is responsible for ensuring that the requirements of the EMPr are implemented on a day to day basis.
2. The full implementation of all of the requirements of the EMPr in terms of the approved method statements.
3. Ensuring that all sub-contractors are familiar with and implement the EMPr.
4. Identifying procedures applicable to the activities they perform and / or control.

5. Identifying, in consultation with the Resident Engineer or his representative which sub-contractors are responsible for compiling (which) method statements.
6. Compiling method statements to meet the procedures and targets.
7. Submitting method statements to the Resident Engineer or his representative for approval.
8. Devising a system for monitoring compliance with method statements and procedures.
9. Identifying environmental training needs and implementing the environmental awareness training programme commissioned by the Resident Engineer or his representative.
10. Implementing corrective and preventive actions recommended by the Resident Engineer or his representative.
11. Reviewing of the EMPr implementation and effectiveness at site meetings with the Resident Engineer or his representative and the ECO.
12. Ensuring regular internal auditing of the implementation of the EMPr.
13. Maintaining and submitting records of waste disposal activities and corrective actions taken to rectify environmental problems on site.
14. Attending EMPr monitoring meetings with the Resident Engineer or his representative.
15. Keeping of a complaints register on site.

3.4.5 Environmental Control Officer

An ECO is to be appointed by the Developer / Project Manager to advise and assist the Resident Engineer or his representative and project team where necessary and to monitor the implementation of the EMPr. The ECO reports to the Developer through the Resident Engineer or his representative. The ECO role is to be fulfilled by a person with previous experience in environmental management and compliance monitoring regarding construction processes.

The ECO's duties include:

1. Supporting and advising the Resident Engineer or his representative, especially as regards to the review of Method Statements, auditing, monitoring and corrective and preventive action.
2. Undertaking monthly environmental site audits.
3. Recommending environmentally appropriate solutions to environmental problems.
4. Recommending additional environmental management measures as appropriate.

5. Attending Project Progress Meetings, as necessary or on a basis determined by the Developer and the Resident Engineer or his representative.
6. Providing a monthly report on environmental compliance to the Developer and Project Manager / Resident Engineer.

It must be noted that the ECO is responsible for providing an independent evaluation of compliance with the EMPr and not for enforcement of the conditions of the EMPr. The responsibility of enforcement of the conditions of the EMPr lies with the Developer and Project Manager, while the DEA or DEDEAT's Environmental Management Inspectors may also enforce existing and potentially new conditions through compliance notices.

3.5 Method Statements

The appropriate Contractors must submit Method Statements to the Resident Engineer or his representative and ECO outlining proposed construction activities, phasing and procedures and methods to comply with the targets stipulated in this EMPr. Method Statements should, where applicable, include Site Establishment Drawings and Plans with sufficient detail to assess the potential impact of the site facilities or to assess the degree of safeguarding provided against pollution and other impacts.

Method Statements indicate how the procedures will be applied in order to meet the relevant targets and are central to the proper implementation of the EMPr. It is anticipated that in addition to assessing the systems and performance of the EMPr, the ECO will scrutinise the formulation of, and adherence to "Method Statements" in some detail.

Method Statements must be submitted before any work on the project is undertaken. The various method statements must be approved by the Resident Engineer or his representative (in consultation with the ECO). The Resident Engineer or his representative must keep copies of these Method Statements and letters of approval (including conditions attached) in a Method Statements file.

The Resident Engineer or his representative (and the ECO) must approve any deviations from the approved Method Statements.

All amendments must be in writing and must be submitted to the Resident Engineer or his representative.

3.6 Meetings

It is anticipated that Progress Meetings, attended by the Resident Engineer or his representative and other members of the project team will be held on a regular basis. It is recommended that a minimum of one meeting every month be held where the EMPr can be discussed. The discussions on the EMPr must continue for the life of the construction of the SACE Ranger Solar PV (2.46MW) Plant with the last meeting being held two

months after construction has been terminated. This final meeting should be preceded by a final site audit by the ECO. The audit will be presented at this final meeting.

The Resident Engineer or his representative may call for additional meetings in response to particular environmental problems. The ECO will attend progress meetings if requested to do so by the Resident Engineer or his representative. The ECO shall decide whether other specialists (archaeologist, etc.) need to attend various meetings or not. At each of the meetings, Contractors will report performance against their defined EMPr objectives and targets.

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Chapter 4: Environmental Management Programme Requirements

4.1 Introduction

The Environmental Management Requirements are designed to address the legislation as well as the issues and impacts raised through the environmental assessment as they relate to the SACE Ranger Solar PV (2.46MW) Plant.

Please note that specific measures have been included as implementation measures instead of separate management plans.

Each of the Environmental Management Requirements is presented as follows:

- A. **Objective:** potentially significant impacts to be mitigated.
- B. **Aspects:** activities likely to cause significant impacts; this list is not exhaustive and other unspecified activities might also cause the respective significant impacts.
- C. **Procedure:** steps and/or actions required to manage (and minimise) the relevant aspects.
- D. **Target:** the (quantitative) level of performance, sometimes determined by legislation, which must be met.
- E. **Responsibility:** main persons responsible for procedures.

Applicable environmental legislation is listed as one of the Environmental Management Requirements in the EMP. However, the list provided is not exhaustive and it is the responsibility of the Resident Engineer or his representative and the Contractors to ensure compliance with all environmental (and other) legislation.

4.2 Legislation

The following list of environmental legislation applies to the SACE Ranger Solar PV (2.46MW) Plant. The list presented here is not necessarily exhaustive. Ultimately, the

Developer, Resident Engineer or his representative and the Contractors are responsible for ensuring identification of and compliance with all appropriate legislation at the national, provincial and local level.

➤ **Table 4: Major Legislation Applicable**

| Issue | Legislation | Authority |
|---|--|--|
| Duty of care and remediation of environmental damage. Control of emergency incidents. | National Environmental Management Act (No. 107 of 1998, as amended) | Department of Environmental Affairs (DEA) Dept. of Economic Development, Environmental Affairs & Tourism (DEDEAT) |
| Air quality and dust generation | National Environmental Management: Air Quality Act (Act No. 39 of 2004) and Regulations | DEA Nelson Mandela Bay Municipality (NMBM) |
| Preservation of archaeological and cultural artefacts | National Heritage Act, (Act 25 of 1999) | South African Heritage Resource Agency (SAHRA) Eastern Cape Provincial Heritage Resource Authority (ECPHRA) |
| Protected Animals, Trees and Plants | Cape Provincial Nature & Environmental Ordinance 19 of 1974 Eastern Cape Environmental Conservation Act of 2003 National Environmental Management: Biodiversity Act (Act No 10 of 2004) National Forest Act of 1998 (Act 84 of 1998) | DEDEAT, DEA DAFF |
| Rezoning and subdivision of land | Land Use Planning Ordinance, 1985 (Ordinance 15 of 1985) | NMBM |
| Agricultural resources | Conservation of Agricultural Resources Act (Act No 73 of 1983) | DAFF |
| Pests Control of the use of registered pesticides, herbicides (weed killers) and fertilisers | Agricultural Pests Act (Act 36 of 1983) Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947) and regulations | DAFF |
| Worker health and safety | Occupational Health and Safety Act, 1993 (Act 85 of 1993) | Dept. of Labour |
| Use of water resources | National Water Act (Act 36 of 1998) | Dept. of Water Affairs (DWA) |
| A socially responsible workforce | Labour Relations Act, 1995 (Act 66 of 1995) | Dept. of Labour |
| Waste disposal | National Environmental Management: Waste Act (Act 59 of 2008) | DEDEAT, Dept. of Environmental Affairs (DEA) |

| Issue | Legislation | Authority |
|-------------------------------------|--|------------------------|
| Noise | Environment Conservation Act 1989 (Act 73 of 1989) Sec 25 | DEA |
| Proclaimed Mountain Catchment Areas | Mountain Catchment Areas Act (Act 63 of 1970) | DWA |
| Health issues | Health Act (Act 63 of 1977) | Dept. of Health |
| Toxic and hazardous substances | Hazardous Substances Act (Act 15 of 1973) National Environmental Management: Waste Act (Act 59 of 2008) | Dept. of Health DEA |
| Fencing | Fencing Act (Act 31 of 1963) | DAFF |

It is recommended that the Developer and Resident Engineer or his representative and / or the Contractors obtain copies of all relevant legislation. An updated file of all legislation should be maintained at the Resident Engineer or his representative's office. Copies of the Environmental Authorisation and the EMPr are to be kept at the site office.

4.3 Environmental Commitment

All persons involved must be made aware of the environmental goals and policy of the Developer and of the appointed project managers and contractors, and encouraged to develop a commitment to compliance with the environmental legislation and to being good neighbours.

4.4 Planning & Design

The following section identifies the management actions that must be completed prior to the commencement of construction activities.

4.4.1 Environmental Authorisation Conditions

Objective

To ensure that all conditions and requirements of the Environmental Authorisation and the EMPr stipulated as pre-requisites for construction are met.

Aspect

Actions are to be completed by the Developer prior to the commencement of the relevant construction activity.

Procedure

Review the full Environmental Authorisation and convey the outstanding actions to the responsible team member.

Targets

Ensure that all requirements of the Environmental Authorisation are in place and that any approval is obtained in writing prior to commencing any construction activities.

Responsibility

Developer, Resident Engineer

4.4.2 Site Planning for Construction

Prior to construction commencing the Resident Engineer in consultation with the ECO and other project staff must compile a “detailed” site plan indicating where the various infrastructures will be located and which areas of the selected site will be utilised for construction and associated operations. The plan should include items such as the location of topsoil stockpile sites. Plans for the location of construction roads / tracks, turning circles, working areas and facilities should seek to minimise the total area that is to be disturbed. A plan of drainage works and the final drainage pattern should generally be included in the rehabilitation plan for the site. Plans for the removal and disposal of wastes and any hazardous or contaminated materials (such as; fuel drums, soil which has been contaminated with leaked fuel or oil, and alien weed infested soil) should be described, as appropriate for the scale of the operation. The construction camp site should also be located on this plan.

The ‘construction planning’ team should plan for the final rehabilitation and restoration of the site before commencing with any construction. For final rehabilitation and restoration of the site to be successful, it is essential that the future rehabilitation requirements be considered in the planning stages and that operators plan for progressive rehabilitation while operations are ongoing.

The following issues (**Table 5**) must be addressed and where appropriate shown on the Environmental Management Site Plan:

➤ **Table 5: Issues to be addressed on Site Plan**

| Issue | Nature / Description |
|--------------------|--|
| Sequence of events | Description of the nature of the process required. Briefly describe the sequence of events that will take place from the time that the contractor moves onto site to the time when the site is handed over to the Project Developer. |
| Health and safety | Potential risks and hazards and precautions that will be taken. Cooking area, hazardous materials site, first aid kit, fuel store, security issues, fire control. Safety of surrounding sensitive receptors (e.g. residents and road users). |
| On site toilets | How many required for the particular development? How long are the toilets required on site? Location of toilets (Site Plan) |

| Issue | Nature / Description |
|--|---|
| Workforce | Number of on-site workers Training of workforce in terms of environmental awareness Management of workforce, particularly sub-contractors |
| Transport and traffic | Transport required for site workers Routes to be used by construction vehicles Demarcate location of traffic turning circle and parking areas (Site Plan) |
| Infrastructure and associated equipment | Nature and extent of infrastructure construction |
| Topsoil | Approximation of quantity to be excavated Where to be stockpiled (Site Plan) How long to be stockpiled Area required for stockpile |
| Earthworks/cleaning | Volume of material to be excavated/cleaned Duration of operations Where stocks to be kept on site (Site Plan) How long to be kept on site Where, when and how to be disposed of |
| Equipment needed for construction activities | Area required for material and equipment storage Duration of works Nature of equipment and necessary materials |
| Drinking water | Quantity required Duration of period in which required Source of water Location of potable water (Site Plan) |
| Cooking/Eating/Rest areas | Area required Equipment required e.g. gas stoves, matches etc. Location - must take into consideration the vegetation conditions (Site Plan) |
| Existing structures | Indication of location of any structures that need to be removed and/or protected |
| Life of project | Working hours Time frame |
| Construction site | Work area required Location of construction site and work area (Site Plan) |
| Environmentally sensitive areas and possible environmental risks associated with construction activities | A training programme on possible environmental risks that may result from construction activities and how to deal with these (including a reporting structure) must be made available prior to construction commencing |
| Waste management | Litter drums - number, type, size, location (Site Plan) Construction of a waste transfer station within the site boundaries Closest registered waste disposal site (Location map) Waste management plan Recycling / material re-use options |

Objective

1. To Plan the construction site together with access routes and associated work areas to allow for sound environmental management and effective rehabilitation of the total site.
2. Positioning of the site camp away from the drainage line (located to the west and north of the proposed site) to reduce any sediment and pollution entering the watercourse, impacting on water quality and aquatic ecosystems.

Aspect

1. All activities related to the construction of the SACE Ranger Solar PV (2.46MW) Plant, and construction camp.

Procedure

1. Compile an annotated base Plan / map of the site indicating the various activity zones, roads and tracks, all stockpile areas, campsites and all other areas which will be used or altered during the construction phase.
2. Indicate details of the access and internal roads and track.
3. Indicate all “no go” areas.
4. Note the location of registered waste disposal sites.
5. Vehicle parking area must be located within the defined activity zone.
6. Designate a main entrance to the construction site. This entrance should be a stabilised access or crossover access point. Identify the best location to place the entry / exit point. It should ideally be located in an elevated position with little or no water flowing to it from upslope and away from any down slope stormwater structures. All deliveries should be able to be made through this point.
7. Once the final details of the site plan have been determined, the Resident Engineer or his representative / and / or the ECO should photograph the proposed construction site and surrounding areas.
8. The site camp to be located 32m from the drainage line (located to the west and north of the proposed site).
9. The site camp to be located in an already disturbed area with existing access, to minimise additional disturbance and clearing of vegetation. Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place.

Targets

Approved site plan before commencing with construction.

Responsibility

Developer, Resident Engineer

4.4.3 Solar PV Infrastructure and Access Road

Objective

1. The risk of soil erosion occurring and/or increasing due to location of solar PV infrastructure and access road.
2. Loss of habitat containing Species of Special Concern (SSCs), including protected species.
3. Changes to the hydrological systems - potential loss of aquatic habitats.
4. Limit the amount of waste to be disposed of at a landfill.
5. To adhere to Eskom requirements infrastructure.
6. Adherence to provincial road requirements.

Aspect

1. Position of solar PV infrastructure and access road on steeper slopes.
2. Removal of SSCs within the footprint area.
3. Sediment entering the dry drainage line located to the west and north of the site may impact on water quality and aquatic ecosystem functioning.
4. Disposing of large quantities of recyclable waste to landfill, and illegal dumping of waste.
5. No disruption or damage to Eskom infrastructure
6. Traffic safety impact due to additional traffic.
7. Deterioration of public road network.

Procedure

1. Solar PV infrastructure and access road surrounding the solar array area to be located outside of steep terrain.
2. Permits must be obtained from the DAFF and/or DEDEAT prior to the removal of protected trees and SSCs.
3. The access road to be aligned away from SSCs, if possible.
4. The solar PV infrastructure, access road and perimeter fence to be located outside of the 32m buffer of the drainage line.

5. Appropriate design of the access roads, to stabilise vulnerable areas, and anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow.
6. Retain any existing drainage controls, such as contour banks, rock filters and cut-off drains, to slow down surface run-off. A rough surface will capture more water and allow rainfall to infiltrate rather than flow directly downhill.
7. Proposed access roads to follow existing route as far as possible.
8. Old waste equipment to be removed and recycled.
9. Obtaining additional road warning traffic signs. Waste that cannot be recycled will be disposed of at a registered landfill site.
10. Proposed road upgrade and/or maintenance meets the approval of the Department of Roads and Public Works.
11. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure and Renewable Energy Generation Plant Setbacks to Eskom Infrastructure per Appendix 5.

Targets

1. Appropriate erosion control measures.
2. Transplanting succulents and geophytes SSCs.
3. No activities within 32m of the drainage line.
4. Access roads to ensure safe movement of vehicles from and onto the R72 and structural integrity.
5. National Environmental Management: Waste Act (Act 59 of 2008) regarding waste disposal to permitted sites.

Responsibility

Developer, Resident Engineer

4.5 Construction

This section presents the environmental requirements for the construction activities. The requirements are worded in broad terms and details of the actions to be undertaken must be presented in the Method Statement for each aspect. Method statements are compiled by the Contractors or their sub-contractors and approved by the Resident Engineer or his representative and the ECO.

4.5.1 Restriction of Working Areas

Objective

1. To restrict access to the site in order to reduce the potential for accidents, dust generation, water pollution, fires, and environmental damage to flora, fauna and other sensitive environmental elements.
2. To keep the demarcated and /or fenced off work area as small as possible.

Aspects

1. Effective demarcation of the construction site.
2. Minimising of traffic within construction areas.
3. Control of vehicles entering the site.

Procedure

1. Prior to any construction beginning, the actual site to be worked must be clearly defined and demarcated by means of highly visible durable materials, e.g. orange netting, no danger tape is to be used.
2. All construction material and machinery required for construction to be located within the demarcated activity zone. Vegetation within the demarcated zone may be cleared while vegetation outside of the zone must be left intact.
3. The demarcated area must cover as small an area as possible. This will prevent the unnecessary trampling of vegetation during the construction and operational phases. It will also result in a smaller area requiring rehabilitation.
4. Once the demarcated area has been approved, a written motivation to alter the boundary must be submitted to the Resident Engineer or his representative for consideration and (possible) approval.
5. The markings of the site must be maintained throughout the construction period, as and where determined by the Resident Engineer or his representative.
6. No activities or dumping may take place outside of the demarcated activity zone. This is to ensure that unnecessary damage is not done to the surrounding areas. It will also ensure the safety of people working on site and people moving in the vicinity of the site.
7. Construction workers are not to be accommodated on-site.
8. Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place.
9. At the end of construction activities all components of the marking system (netting and/or poles) must be removed, to the satisfaction of the Resident Engineer or his representative. All damaged areas must be fully rehabilitated.

10. Vehicles must be instructed to remain on the track and deviations from the approved track must not be permitted, as this leads to creating multiple tracks and increasing the potential for erosion. In exceptional circumstances where a vehicle is forced to deviate from an approved track (e.g. to fight fires) the deviation must be rehabilitated immediately after such an event. All deviations must be reported to the Resident Engineer or his representative.
11. Turning of vehicles should only take place within a clearly demarcated “turn area” located adjacent to the construction site. The contractors must co-ordinate the loading and offloading of material during the construction phase so as to ensure that vehicular movement is in one direction only at any one time and that sidetracks are not created on the site.
12. Production of an Area Restriction Method Statement which includes the access road.

Targets

1. Approved Area Restriction Method Statement.
2. Controlled access to the site for the contractors, work crews, sub-contractors.
3. Prohibited access to the public, with adequate sign posting.

Responsibility

Developer, Resident Engineer, Contractor

4.5.2 Flora, Fauna and Avifauna Management

Environmental impacts, such as erosion caused by storm water run-off and weed invasion, increase proportionally with the increasing area of disturbance. It is very important that the total disturbed area be minimised. Land clearing and disturbance provides opportunity for the invasion of exotic weeds. The construction of roads can also provide an avenue by which exotic species can be transported into an area. Weed invasion can be minimised by taking measures to ensure that construction operations do not introduce exotic species to an area, and also by adopting measures to manage weed infestations at the site until such time as native species have become established after rehabilitation.

Objective

1. To minimise damage to indigenous flora and fauna utilising the construction site and the surrounding areas.
2. To re-vegetate the area as necessary to alleviate erosion potential and to improve any aesthetic issues.

3. To ensure minimum disturbance to indigenous flora, fauna and avifauna occupying the area influenced by construction.
4. To control and prevent alien vegetation growth.

Aspects

Areas to be cleared for construction, areas to be re-vegetated; lighting of fires

Procedure

1. The Conservation of Agricultural Resources Act (Act 43 of 1983) states that no person shall dispense any weed in the country, and the National Environmental Management: Biodiversity Act (Act No 10 of 2004) regulates alien and invasive species. In accordance with the Act every effort must be made to ensure that the site and other clearly marked areas relating to the operation and decommissioning is kept free of weeds or invasive plants.
2. Care must be taken to remove all alien vegetation, which invades the site. The site must be inspected weekly by the Contractor's Environmental Officer.
3. Removal of alien vegetation (either physically (preferred) or through chemical means) must be included as a routine activity during the construction phase.
4. A Flora and Fauna Method Statement incorporating the procedures and the site maintenance plan, including timing and physical boundaries, must be submitted by the appropriate contractors to the Resident Engineer or his representative for approval.
5. All cleared areas adjacent to the work area to be re-vegetated and maintained to control erosion and minimise dust.
6. Where possible, vegetation occurring inside the demarcated activity zone should be cut to ground level, leaving the roots and soil undisturbed rather than removed. This will assist in preventing soil erosion if any heavy rains fall during the construction period.
7. All the areas cleared must be rehabilitated with suitable indigenous vegetation upon completion of the construction works.
8. Fires are to be prohibited on and adjacent to the site, during the construction phase.
9. Excess soil from excavations must not be spread on the surrounding vegetation.
10. Surrounding vegetation is a valuable resource that can be needlessly destroyed by brief activities with heavy machinery and indiscriminate use of the area by humans. All site workers must be informed of the limits of the site and should be instructed not to utilise areas outside of the defined activity zone.
11. Vegetation that was cleared may provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation.

12. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed.
13. Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone.
14. All construction vehicles must stay on single demarcated access tracks to avoid small fauna.
15. The site camp to be located in an already disturbed area with existing access.
16. Fires are to be prohibited on and adjacent to the site.
17. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove animals.
18. A search and rescue to be undertaken prior to construction and animals to be removed from the solar site.

Targets

1. Approved Flora and Fauna Method Statement.
2. All vertebrate species encountered must be relocated from the demarcated areas immediately prior to beginning with construction work.
3. No fires are permitted.

Responsibility

Resident Engineer, Contractor

4.5.3 Cultural Historic, Archaeological and Palaeontological

Objective

To limit damage to possible cultural historic, archaeological and palaeontological artefacts and sites, features and objects.

Aspects

Clearing of sites, excavations and related activities

Procedure

1. The Resident Engineer or his representative must ensure that all staff are trained to recognise potential cultural historic, archaeological and palaeontological artefacts and sites. The Resident Engineer or his representative must also ensure that a system is in place to halt the specific activity if such a site is identified. The Resident Engineer or his representative may consider offering a reward to personnel who identify such sites.

2. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the find brought to the immediate attention of the Resident Engineer or his representative who will report it to the Eastern Cape Provincial Heritage Resources Authority (ECPHRA, 043 6422811). The area will be fenced off with a radius of 20m around the unearthed item, demarcated as a no-go area and access will be prohibited.
3. The Resident Engineer or his representative must then arrange for the appointment of a qualified archaeologist to examine the site and recommend further action.
4. Following consultation with the archaeologist and ECPHRA, the Resident Engineer or his representative will be responsible for approving the Contractor's resumption of normal activities.
5. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site.
6. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51.(1).
7. A Cultural Historic, Archaeological and Palaeontological Method Statement incorporating the above procedures and the site clearance Programme, including timing, physical boundaries, the maximum depth of excavations and programming of these excavations, must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.
8. Human remains confirmed younger than 60 years (to be confirmed by the police forensic unit or archaeologist) are to be reported directly to the nearest police station.

Targets

1. Approved Cultural Historic, Archaeological and Palaeontological Method Statement.
2. No cultural historic, archaeological or palaeontological artefacts or sites may be purposefully damaged or destroyed. (It is illegal to disturb fossils or other historic and or cultural sites and objects without the prior consent of the Eastern Cape Provincial Heritage Resources Authority).

Responsibility

Developer, Resident Engineer, Contractor

4.5.4 Preservation of Topsoil

Topsoil is usually the darker, upper soil layer. Though only 10 - 30 cm deep it contains nutrients, minerals, seed, and organic matter, which helps to bind it all together. The regenerative capacity of the natural soil should be protected during the construction

activities. Topsoil is a very important requirement for low cost revegetation of disturbed sites.

Objective

To reduce the size of all stripped areas and to store stripped topsoil separately for use in site rehabilitation and landscaping once construction has been completed.

Aspects

Storage of stockpiles of soil, conservation of additional topsoil areas, erosion control.

Procedure

1. The shallow topsoil layer to be stockpiled separately from the subsoil layers, should the excavation exceed 0.5m.
2. Topsoil must be stripped from the work area and stockpiled on an area outside of the immediate work area, but inside the demarcated work area.
3. Site clearing and construction should be undertaken in a progressive manner (i.e. the entire development area should not be cleared at once, but should rather be undertaken in stages) so as to minimise the area of soil exposed at any one time.
4. 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.
5. Topsoil must be stockpiled separately from the subsoil layers and used during reinstatement thus allowing plants to rapidly re-colonise the bare soil areas.
6. Do not strip topsoil when saturated, as this will exacerbate the damage to the soil structure. If topsoil must be stockpiled, it deteriorates in quality while stockpiled.
7. Stockpiled soils shall be neat, and the dumped soil shall be flattened immediately after placement to ensure minimum exposure to wind and water.
8. Topsoil stockpiles are not to be higher than 2 m and steeper than 1:3, and are not to be placed within 32m of the drainage line.
9. Stormwater runoff to be diverted away from stockpiles.
10. Silt fences to be included around stock piles.
11. Vegetation being cleared may contain small amounts of seed, or provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation. Smaller sized vegetative material may provide useful mulch for later use in erosion control works, or else it should be combined with the topsoil.

12. Topsoil must be utilised in the rehabilitation of the site once the construction work has been completed. Any excess topsoil must be removed from the site. Excess topsoil can be used in erosion control works on any other disturbed area.
13. *Cynodon dactylon* (kweek) (or an alternative such as *Stenotaphrum secundatum* or other suitable species) should be used to revegetate the topsoil stockpiles if they are to be left for longer than 90 days. A typical seeding rate would be 6 kg seed per hectare. (Applicable only where stockpiled soil will be retained for longer than 3 months). For shorter periods a mulch of natural vegetation cut on site during the clearing operation (grass and shrubs) can be placed over the stockpiled soil.
14. The maintenance of soil erosion control measures must be strictly monitored and reported.
15. A Topsoil Preservation Method Statement incorporating the above procedures, including timing, must be submitted to the Resident Engineer or his representative for approval.

Targets

1. Approved Topsoil Preservation Method Statement.
2. All topsoil must be separately stripped and stored.

Responsibility

Resident Engineer, Contractor

4.5.5 Air Quality Management

Objective

1. To minimise nuisance and potential health problems, and potential damage to flora, associated with dust and/or sand.
2. Air pollution from construction activities.

Aspects

1. Vehicle movement, stockpiling (of sand) and site clearing.
2. Poorly maintained construction vehicles and burning materials for warmth during winter by contraction staff.

Procedure

1. Staff should be trained to report dust-generating activities as soon as they detect them.
2. Dust can be suppressed by a combination of:
 - a) Daily spraying of exposed areas with water (not potable or contaminated water), at a frequency to be determined by the Resident Engineer or his representative.

- b) Compacting exposed areas.
 - c) Using environmentally acceptable chemical and other suppression methods where appropriate.
 - d) Covering long-term stockpiles or temporarily re-vegetating them.
 - e) Halting dust generating activities when wind speed exceeds 35 km/h (See Table 6).
 - f) Imposing a 25 km/h speed limit on access roads.
 - g) Re-vegetating exposed areas during the operating and decommissioning phases.
3. Prompt rehabilitation and wetting down of recently cleared areas to minimize dust creation.
 4. Stockpiles (e.g. soil) should be maintained for as short a time as possible and should be enclosed by wind breaking enclosures of similar height to the stockpile. Stockpiles should be situated away from the site boundary, main roads, and nearby receptors and should take into account the predominant wind direction.
 5. Until vegetation used in rehabilitation efforts has established, temporary stabilization methods must be used (e.g. protecting exposed soils with coarse granular materials, mulches, or straw).
 6. Construction should be undertaken in a phased manner, so as to limit the size of the area to be exposed at any one time.
 7. The Contractor will be responsible for the continued control of dust arising from his operations. Should a dust control method prove to be ineffective by the Project Manager and ECO, alternative methods will need to be conducted by the Contractor. Any changes in the dust control methods shall be for the cost of the Contractor.
 8. Any complaints about dust recorded in the complaints register must be immediately investigated by the Resident Engineer or his representative and addressed. **Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.**
 9. The Resident Engineer or his representative (advised by the ECO) must implement a more rigorous dust-monitoring programme (instrument measurement) if there are persistent complaints about dust in the area.
 10. No waste, vegetation or any other material shall be burnt in compliance with smoke control regulations issued in accordance with the Air Quality Act (Act 39 of 2004).
 11. Trucks transporting any form of soil or waste should be covered with a tarpaulin.

12. The speed of the traffic on the access roads needs to be kept slow (25 km/h) to curb any unnecessary dust.

13. Vehicles and machinery will be maintained in good running condition.

14. No waste may be buried.

➤ **Table 6: Table of Wind Speeds to be Used as a Guide for Dust Control**

| Wind speed (km/h) | Designation | Description |
|-------------------|------------------|---|
| < 2 | calm | <i>smoke rises vertically, trees do not move</i> |
| 2-5 | light air | <i>smoke drift indicates wind direction</i> |
| 6-11 | light breeze | <i>weather vane moves, leaves rustle</i> |
| 12-19 | gentle breeze | <i>leaves and twigs in constant motion</i> |
| 20-29 | moderate breeze | <i>dust and loose paper raised, small branches move</i> |
| 30-38 | fresh breeze | <i>small trees sway</i> |
| 39-50 | strong breeze | <i>large branches move, wind whistles wires</i> |
| 51-61 | moderate gale | <i>whole trees move, walking affected</i> |
| 62-74 | fresh gale | <i>twigs break off trees, walking difficult</i> |
| 75-86 | strong gale | <i>slight structural damage occurs, branches break</i> |
| 87-100 | whole gale | <i>trees uprooted, considerable structural damage</i> |
| 101-118 | storm | <i>widespread damage</i> |
| 119+ | <i>hurricane</i> | <i>severe and extensive damage</i> |

Targets

1. Approved Air Quality Method Statements.
2. Dust levels are not to exceed 600mg/m²/day averaged over an annual period for industrial and rural areas.
3. Excessive dust generation as determined visually by the ECO, Resident Engineer or his representative is not permitted.

Responsibility

Resident Engineer, Contractor

4.5.6 Noise Management

Objective

To avoid disturbing residents, and fauna (especially birds), with particular reference to construction and decommissioning activities on the site.

Aspects

Operation of construction equipment, assorted maintenance and vehicle operation, construction staff.

Procedure

1. Where possible the contractors must use equipment, which limits noise generation.
2. Any complaints pertaining to noise and vibrations as recorded in the complaint register must be immediately investigated by the Resident Engineer or his representative and addressed. SABS 0103 - 1983 Code of Practice indicates that an increase of ambient noise levels by 5 dB (A) will induce "sporadic complaint" from the community.
3. Construction activities to be limited to weekdays between 07:00 and 17:00; and Saturdays until 13:00. No work is to be undertaken on Sundays or public holidays.
4. Vehicles and machinery to be kept in good working order with the prescribed mufflers and silencers.
5. Attempts must be made to schedule noisy activities so that they occur simultaneously and over as short a period as possible.
6. Vibration inducing activities must also be simultaneously scheduled wherever possible.
7. A formal noise monitoring programme must be implemented by the Resident Engineer or his representative if there are persistent complaints.
8. A Noise and Vibration Method Statement must be submitted by the appropriate contractors (s) to the Resident Engineer or his representative for approval.
9. No loud music will be allowed on site or in the construction camp.
10. No construction staff to be housed on site.

Targets

1. Approved Noise and Vibration Method Statement.
2. The Occupational Health and Safety Act 85 of 1993 stipulates that noise levels in excess of 85 dB (A) at 1 metre from equipment are not permitted.
3. Excessive noise as determined subjectively by the Resident Engineer or his representative.

Responsibility

Resident Engineer, Contractor

4.5.7 Water Consumption

Objective

To minimise the consumption of water

Aspects

Equipment servicing areas, domestic water use, water required for construction and related activities.

Procedure

1. Opportunities to reduce consumption of or re-use water must be adopted wherever possible.
2. Methods must be employed to ensure that water is not wasted. Environmental awareness training must ensure that staff is aware of the need to conserve water and to minimise the pollution of water.
3. A Water Consumption Method Statement must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.
4. Potable water tanks must be installed at the construction site for human consumption and sanitation purposes. The contractor will ensure safe drinkable water for the labourers during the construction phase.

Targets

1. Approved Water Consumption Method Statement
2. The Resident Engineer or his representative to set a realistic water consumption quota.

Responsibility

Resident Engineer, Contractor

4.5.8 Water Quality and Stormwater Management

Sediment derived from erosion by water, and other water borne contaminants such as diesel and oil, are often sources of pollution arising from construction activities. If environmental management is inadequate, water quality may be affected beyond the boundary of the project.

Objective

1. To minimise the potential contamination of ground and surface water
2. To minimise soil erosion.

Aspects

1. Poorly maintained equipment and vehicles, vehicle parking areas, and contaminated run-off during the construction.
2. Spillages from construction materials, such as diesel, oils and cement.
3. Construction activities leading to soil erosion.

Procedure

1. The Resident Engineer or his representative shall ensure that all precautions are taken to ensure that no surface or ground water becomes polluted. Any deliberate or unplanned pollution of water is an offence in terms of the National Water Act (Act 36 of 1998) and is punishable with a fine not exceeding R50 000 and / or two years imprisonment.
2. Ensure all construction machinery is in sound working order and free of leaks from oil, fuel or hydraulic and excessive exhaust fume emissions.
3. Establish a dedicated area for construction vehicles, **machinery or equipment** to refuel and where cement can be mixed. Vehicle re-fuelling and cement mixing must only take place on impervious surfaces.
4. No vehicle must be refuelled, serviced or repaired on the construction site, except in designated areas. **Only emergency repairs to be conducted on site, all regular service maintenance to be conducted off site.**
5. Temporary storm-water runoff basins and drainage ditches may have to be constructed in order to capture storm-water.
6. Wherever possible, drainage works should seek to mimic natural drainage patterns and utilise natural drainage lines with retained vegetation.
7. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised.
8. A cut-off drain or diversion banks above all excavation/cuts will help prevent water from entering the site. Cut-off drains should discharge into vegetated natural drainage lines or via a level sill that distributes run-off across a stable vegetated area.
9. Contour drains can also be used to capture and slow down water that would otherwise gather momentum as it travels down the slope. Rate of run-off increases dramatically following vegetation removal; hence the total area exposed should be kept to a minimum.

10. Gradients on access tracks should be controlled, drainage structures well maintained, and regular cross drains or culverts installed.
11. Sedimentation into drainage lines must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas. Silt fences to be included around stock piles and along the western and northern boundary adjacent to the drainage line.
12. Details of storage of all chemicals must be submitted to the Resident Engineer or his representative for approval. Refer to **Section 4.5.10** for additional measures.
13. Emergency plans must be in place in case of spillages onto road surfaces and/or open areas. **Spill kits for small spills to be kept on site.**
14. Contaminated soil (e.g. in vehicle parking areas, under generators) must be removed to an appropriate permitted solid waste disposal facility. **Waste manifests to be kept by contractors to prove legal disposal of contaminated soil.**
15. Environmental awareness training must ensure that staff is aware of the need to prevent water pollution.
16. A Water Quality Method Statement must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.
17. Should a polluting incident occur, the Resident Engineer or his representative shall immediately contact the regional office of the Department of Water Affairs (DWA) (requirement of National Water Act). Cleanup shall take place in consultation with the DWA.
18. No access, construction activities or stockpiling to occur within 32 m of the drainage line.
19. No access or activities allowed in areas with steep terrain.
20. **Borehole water samples are to be taken prior to construction to determine a baseline for the water quality.**

Targets

1. Approved Water Management Method Statement.
2. Government Gazette 665 of 6 September 2013 governing effluent quality.
3. No contamination of groundwater.
4. SABS 241 effluent discharge standard

Responsibility

Resident Engineer, Contractor

4.5.9 Solid and Liquid Waste Management

Objective

1. To limit the potential for groundwater and surface water pollution as well as the visible and malodorous accumulation of waste materials.
2. To prevent littering and associated environmental impacts.
3. Limit the amount of waste to be disposed of at a landfill.

Aspects

General construction and decommissioning activities

Procedure

1. Good housekeeping to be undertaken at all times. No illegal dumping or burning of waste allowed. **Waste is not to be buried.**
2. Awareness raising to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping.
3. Toilet facilities must be made available to construction staff. If portable chemical toilets are used, these are to be secured to the ground and cleaned at least weekly. **Water should be provided for washing and sanitary bins for women. Waste to be disposed of at a wastewater treatment works.**
4. A system for identifying, classifying and disposing of solid waste must be devised.
5. Waste should be classified as domestic (including litter), hazardous, or recyclable.
6. Waste materials (e.g. paper and glass) must be sorted and sent for recycling, where the quantity allows this and if the facilities are available. Certain waste materials are valuable and could be sold to (local) entrepreneurs for further use.
7. No littering is permitted on site; litterbins with secured lids must be provided throughout the site. These litter bins must be predator and scavenger proof.
8. Centralised eating facilities must be provided for workers to facilitate litter control.
9. All non-hazardous solid waste must be removed on a regular basis and disposed of off-site at suitably permitted waste facilities (Koedoeskloof licenced landfill site). This includes any building rubble left after construction.
10. The Contractor may not utilise the municipal waste collection services for disposal of waste.
11. When hazardous wastes are already present at the site, the contractor or subcontractor who first discovers the material is responsible for notifying the Resident Engineer, developer, and / or land owner. The local authority, the provincial authority and the Department of Water and Environmental Affairs must also be notified. Because the

hazardous waste was present at the site prior to construction activities, the developer or owner typically is responsible for ensuring that the hazardous wastes are handled and disposed of properly.

12. When hazardous wastes are produced at the site, the contractor or subcontractor who produces the hazardous waste typically is responsible for ensuring its proper handling and disposal. Hazardous waste (e.g. old oil) to be stored separately in impermeable (i.e. leak proof) containers, and sent for recycling.
13. Hazardous materials must only be disposed of at an approved hazardous waste disposal facility. No hazardous waste material to be disposed of as general waste.
14. A register of waste disposal (including waste manifests) and sorting records must be retained by the contractors and submitted to the Resident Engineer or his representative for auditing purposes.
15. Appropriate temporary disposal areas must be covered and be on an impermeable floor.
16. Excess soil and stone removed during the excavations should be used in site levelling.
17. Excess material not being reused, should be removed from the site and disposed of at a registered waste site (Koedoeskloof licenced landfill site).
18. A Waste Management Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.
19. The requirements of the Waste Act (Act 59 of 2008), Health Act (Act 50 of 1992) and the National Environment Management Act (Act 107 of 1998) are applicable to waste management.
20. Cleared vegetation to be mulched or disposed of at the Koedoeskloof licensed landfill site. Stockpiles of vegetation not to be left on site due to fire hazard.

Targets

1. Approved Waste Management Method Statement.
2. National Environmental Management: Waste Act (Act 59 of 2008) restricting waste disposal to permitted sites.
3. National Water Act (Act 36 of 1998)
4. All waste material must be removed from the site and suitably disposed of; no solid wastes shall be stored on-site for more than one week (i.e. 7 days).
5. Most materials from building and construction sites can be recycled or reused. Table 7 demonstrates some reuse options, and is for guidance only.

Responsibility

Resident Engineer, Contractor

➤ **Table 7: Reuse and recycling potential of materials (For Guidance Only)**

| Materials | Process | End use |
|--------------|-----------------------|--|
| Concrete | Crushed and recycled | Used as Fill, levelling, road base |
| | Surplus | Used as base for paths, minor slabs |
| Other timber | Cleaned and reused | Used as Formwork, bridging, propping |
| | Ground and recycled | Into Mulch, engineered timber products |
| Trees | Relocated and reused | Used in Landscaping on or off site |
| Greenwaste | Shredded and recycled | Used in Compost, mulch, fertilizer |
| Overburden | Screened and reused | Used as Topsoil |
| Metals | Scrap metals recycled | Into New metal products |
| Packaging | Shredded and recycled | Into New packaging |

4.5.10 Fuel and Hazardous Materials Management

Hazardous materials and related waste includes the following materials:

- a) Ignitable (flashpoint of less than 140 degrees), such as paint thinners, paints, paint and varnish strippers, epoxy resins, adhesives, degreasers, and spent cleaning solvents.
- b) Corrosive (acids with a pH less than 2 or bases with a pH greater than 12.5), such as rust removers, cleaning fluids, and battery acids.
- c) Reactive (explosive or violently reactive), such as cyanide, plating waste, bleaches, and waste oxidizers.
- d) Toxic (meeting certain concentrations), such as materials containing metals (e.g., mercury, cadmium, or lead) or solvents (e.g., carbon tetrachloride or methyl ethyl ketone). Materials may include adhesives, paints, coatings, polishes, varnishes, thinners, or treated woods.
- e) Batteries;
- f) Pesticides (as defined by the Universal Waste definition); and
- g) Any other hazardous waste or material.

Objective

To ensure that materials are appropriately stored in order to minimise the potential for pollution and accidents.

Aspects

Storage of fuels solvents, and other hazardous and toxic substances

Procedure

1. Fuel, solvents and other hazardous or toxic substances must be securely stored in a restricted, locked facility approved by the Resident Engineer or his representative.
2. Fuel and hazardous materials containers must be properly and boldly labelled.
3. Chemicals must be stored safely on site, on an impermeable lined surface and surrounded by lined bunds, as per SANS 10128. Chemical storage containers must be inspected daily so that any leaks are detected early.
4. Storage facilities must be maintained and fire-fighting equipment in proportion to the fire risk that is presented by the type of construction and other on-site activities and materials used on site is to be available and kept in good operating order at all times.
5. An emergency response plan (e.g. in case of fire) must be formulated, including steps taken to manage the capture and treatment of polluted water.
6. Generators and fuel supply needed for equipment during the construction phase must be placed on trays, which rest on clean river sand. This is to prevent any oil or fuel spills. The river sand (clean or contaminated) must be removed from the site once construction has been completed. All contaminated material must be disposed of at a registered hazardous waste disposal facility. Vehicles are also to be parked over drip trays.
7. No cement or concrete should be mixed on the soil surface or on plastic sheeting. Cement mixing is to undertaken in trays.
8. Cement mixers must be placed on large trays to prevent accidental spills onto the soil surface. Where cement or concrete is mixed on the soil, contaminated soils should be removed and disposed of at a registered waste disposal site.
9. The Resident Engineer must ensure that the contractors obtain material safety data sheets for all materials used on site. Where applicable, all site workers must be informed of the hazardous nature of the materials being used.
10. A Fuels and Hazardous Materials Storage Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.
11. The provisions of the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947) and the Hazardous Substances Act (Act 15 of 1973) must be adhered to.
12. No stockpiling or storage within 32 m of a drainage line.

Targets

1. Approved Fuels and Hazardous Materials Storage Method Statement.

2. Approved Emergency Response Procedure.
3. Fuels and hazardous liquids must be stored in an impervious, bunded and covered area with a capacity of 110% of the largest single storage tank.

Responsibility

Resident Engineer, Contractor

4.5.11 Traffic Management

Objective

Potential increases in traffic within the area, with resultant potential congestion, road damage, road safety, noise, etc. issues.

Aspects

1. Increased traffic on local roads, etc.
2. Traffic safety impact due to additional traffic.
3. Deterioration of public road network.

Procedure

1. Flagmen to be posted when construction works are being undertaken adjacent to main or secondary roads.
2. Signage is to be displayed regarding construction activities.
3. Construction vehicles are to keep to the speed limits.
4. Regular maintenance of road during construction phase.
5. Additional warning signage regarding sharp bends in road.
6. Vegetation is cleared on the DR01940 road verge at the entrance to the solar site.
7. Contractor to leave the road in the same state as when construction started.

Targets

No accidents

No spillages of any material onto roads.

Responsibility

Resident Engineer, Contractor

4.5.12 Visual Management

Objective

Visual intrusion on neighbouring landowners and hikers in the Groendal Wilderness Area and Springs Local Nature Reserve.

Aspects

Cleared areas of vegetation, the construction camp.

Procedure

1. Construction workers are not to be accommodated on-site.
2. Only shrubs are to be removed for the construction camp area and laydown areas.
3. Shrubs and trees located on the boundary of the site should be left intact.
4. Cleared areas not required for operational use to be re-vegetated with indigenous vegetation.

Targets

Minimise visual intrusion onto neighbouring property.

Responsibility

Resident Engineer, Contractor

4.5.13 Socio-Economic, Health, Safety and Security

Objective

1. To ensure the health and safety of the construction workforce.
2. To ensure that activities associated with construction, particularly the presence of the workforce, do not create social problems or exacerbate any which may already exist.

Aspects

1. Staff and surrounding community welfare, health and safety.
2. Fire management

Procedure: Health, Safety and Security

1. Adequate ablution facilities and chemical toilet facilities must be erected and maintained in good order on the site for the duration of the construction and decommissioning phase. Toilets must be secured to the ground. Toilets should be removed from site when construction is completed. Waste must be disposed of at a registered waste site.

2. Adequate clean drinking water must be available to construction staff at all times during the construction period.
3. An area must be demarcated for staff to conduct all necessary cooking activities. The site must be selected to ensure that there is no risk of fires. It would be advisable to ensure that small gas cookers are available on site, if needed.
4. Work crews are not to be housed on site and where feasible should be accommodated in suitable residential areas in close proximity to the construction site.
5. Awareness raising to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping.
6. HIV and STD awareness training with construction staff.
7. Security to be provided after hours to protect equipment in the construction camp.
8. Excavations to be demarcated with orange netting. Excavations are to be checked daily, prior to work commencing, for any animals.
9. Shoring of excavations to ensure the safe workings of site staff.
10. The construction area must be demarcated and access controlled for the duration of the construction period.
11. Signage is to be displayed regarding construction activities.
12. Construction vehicles must adhere to speed limits and must be made aware of the possibility of people walking and living in close proximity to the site.
13. A health and safety method statement/program is essential.
14. General risks associated with the construction activities should be addressed through compliance with the relevant health and safety procedures and regulations.
15. Access to and from the construction site(s) should be closely monitored and contractors should be required to make the necessary arrangements for the transport of workers to and from the site on a daily basis.
16. Visitors to report to the Site Office, and appropriate Protective Personal Equipment to be worn by visitors.
17. Discuss the safety and security issues, as well as construction schedule with the local community policing forum and local SAPS.
18. The solar security to check with the Hurn family during construction.
19. Adjacent landowners are to be notified 14 days prior to construction commencement.

20. Fire-fighting equipment in proportion to the fire risk that is presented by the type of construction and other on-site activities and materials used on site is to be available and kept in good operating order at all times.
21. Any welding or other sources of heating of materials must be done in a controlled environment, under appropriate supervision, in such a manner as to minimise the risk of fires and/or injury to staff. No “hot work” is to be undertaken on days where the Fire Danger Index is “orange” or “red”.
22. Smoking will not be permitted in those areas where there is a fire hazard. These areas include the fuel storage areas and any area where the vegetation or other material may support the rapid spread of an initial flame. Where possible, these areas (e.g. at the chemical and hazardous substances storage area) are to be demarcated with no-smoking signs.
23. Installation of solar panels to be undertaken by trained personnel only and in accordance with the manufacturer’s guide.
24. Water samples are to be taken prior to construction to determine a baseline for the water quality.

Procedure: Employment

1. A policy of employing local people should be implemented wherever possible. This will ensure that benefits of the construction are provided to local communities and will prevent an influx of job seekers to the site. This policy must be finalised before the hiring of sub-contractors.
2. Local sub-contractors should be employed wherever possible to maximise the localised economic benefits of the project.
3. Access to the construction site must be strictly controlled.
4. A mechanism must be established to receive and address complaints from the staff.
5. For security reasons, cash wages should be paid off site.

Procedure: Existing Services and Infrastructure

1. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure and Renewable Energy Generation Plant Setbacks to Eskom Infrastructure per **Appendix 5**.

Targets

1. Approved Social, Health and Safety Method Statement.
2. Labour Relations Act, 1995 (Act 66 of 1995).

3. The Contractor shall ensure compliance with the Occupational Health and Safety Act (Act 85 of 1993) and the relevant regulations.

Responsibility

Resident Engineer, Contractor

4.6 Rehabilitation Management

The term 'rehabilitation' is used to encompass all of those measures, which seek to repair disturbed or degraded land, and to return such land to a stable and non-polluting state, which is suitable for the proposed future use of the land. The rehabilitation of the construction and surrounding area is an integral part of the development. Progressive rehabilitation refers to the rehabilitation of areas that are no longer required for the construction activities while the other operations continue. Progressive rehabilitation is an important component of any development and should be implemented where feasible.

The main aims of rehabilitation work are to:

- a) Achieve long-term stabilisation of all disturbed areas to minimise ongoing erosion;
- b) Re-vegetate all disturbed areas with suitable plant species;
- c) Minimise visual impact of disturbed areas; and
- d) Ensure that disturbed areas are safe for future uses.

Establishment of a self-sustaining cover of vegetation is the best low maintenance stabiliser of disturbed sites in the long term. Generally, the vegetation type, which existed before the disturbance, or a similar vegetation type will be most successful afterwards, following an initial re-establishment period.

Objective

1. To revegetate areas that has been disturbed during the construction phase.
2. To re-establish a native vegetation cover, which is similar in species composition to that, which existed before the disturbance and to prevent erosion on the site; and manage adverse visual impacts from critical viewpoints. The site should be left in a stable state that blends in with the surrounding area.

Aspects

1. Dismantling and removal of all construction infrastructure, re-vegetation and landscaping of disturbed areas on site, replacement of topsoil.
2. Ensuring that adequate erosion control measures are in place.

Procedure

1. All construction infrastructure, equipment, materials and wastes must be removed from the site upon completion of construction (or earlier, in a phased manner, if possible).
2. Rehabilitation of surplus tracks and turning areas, camp sites and stockpiles (i.e. areas not required to be clear of vegetation during operations).
3. Knobs and stockpiles should be levelled and waste rock / overburden pushed into hollows, i.e. soil erosion areas that have no vegetation in order to restore eroded areas.
4. All compacted and previously used construction areas shall be scarified / ripped to a depth of 150 mm prior to topsoil being replaced. Ripping will promote water infiltration and root penetration. Ripping should be carried out when the soil is relatively dry to increase soil break-up.
5. Stored topsoil must be replaced uniformly on disturbed areas to a depth of at least 150 mm. Re-spread soil should be left with a rough surface with many suitable locations for lodgement and germination of seeds. Avoid spreading soil when saturated or sticky, as compaction and other damage to the soil structure will occur.
6. These areas must be landscaped to improve the aesthetic appearance of the site; suitably landscaped berms of topsoil may be created as part of the erosion control programme.
7. Any excess topsoil (not used in landscaping) must be disposed of in an environmentally acceptable manner.
8. All disturbed areas must be re-vegetated with suitable indigenous (i.e. naturally occurring in the area) vegetation, e.g. grass species - *Eragrostis* spp.
9. A Site Rehabilitation Method Statement must be submitted by the contractors to the Resident Engineer or his representative for approval.
10. The soil erosion measures installed need to be checked weekly.

Targets

1. Approved Site Rehabilitation Method Statement.
2. Site rehabilitation to be completed within one month after the end of the construction period, or by an alternative date stipulated by the Resident Engineer or his representative.

Responsibility

Developer, Resident Engineer, Contractor

4.7 Operation

This section presents the environmental requirements during the operational phase.

4.7.1 Flora, Fauna and Avifauna Management

Objective

1. Limit the spread of alien vegetation.
2. Disturbance to fauna and avifauna from operational activities.

Aspects

1. Controlling the spread of alien vegetation.
2. Overhead transmissions lines may present a potential collision risk or electrocution to avifauna.

Procedure

1. Alien and noxious plant regrowth to be monitored monthly by the Developer and area to be kept free of alien invasive and noxious plants.
2. Removal of alien vegetation either physically (preferred) or through chemical means.
3. Shrubs and trees located on the boundary of the site to be left intact and not removed.
4. Area surrounding the solar array to be grassed with an indigenous grass species (e.g. *Eragrostis* spp).
5. All overhead power lines to include bird deflectors.
6. Electrical cabling and connecting distribution lines to be underground.
7. The fence line is to be checked on a weekly basis for any fauna species caught in the strands.
8. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove animals.

Targets

No alien or invasive species within the site area.

Responsibility

Developer

4.7.2 Air Quality Management

Objective

1. To minimise nuisance and potential health problems, and potential damage to flora, associated with dust and/or sand.

2. Air pollution from operational activities.

Aspects

1. Vehicle movement, and cleared areas.

Procedure

1. Vehicles must adhere to speed limits on access gravel road (25 km/h).
2. No materials shall be burnt.
3. Maintaining re-vegetated areas to limit exposed soils.
4. Broken, cracked or aged solar panels are to be replaced immediately.
5. No waste may be buried.
6. Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.
7. Trucks transporting any form of soil or waste should be covered with a tarpaulin.

Targets

1. Dust levels are not to exceed 600mg/m²/day averaged over an annual period for industrial and rural areas.

Responsibility

Developer

4.7.3 Socio-Economic, Health, Safety and Security

Objective

Health, safety, security and fire management

Aspects

1. To ensure the health and safety of the maintenance workforce.
2. To ensure that activities associated with construction, particularly the presence of the workforce, do not create social problems or exacerbate any which may already exist.
3. To minimise risks for veld fires.

Procedure: Health, Safety and Security (including Fire Management)

1. Maintenance to be undertaken by trained personnel only.
2. Only properly trained personnel who understand the risks of applying water to electrical components should clean modules.

3. Trained personnel shall wear appropriate electrically insulating Personal Protective Equipment (PPE) during cleaning and inspection operations.
4. Before cleaning, thoroughly inspect modules for cracks, damage, and loose connections.
5. Cleaning of solar panels to be undertaken per the manufacturer's guidelines.
6. Solar PV site to be enclosed by a fence with a locked gate.
7. The solar security to check with the Hurn family during operations.
8. Adjacent landowners are to be notified 14 days prior to operational commencement.
9. Additional security aspects to be considered, e.g. security to check the site on a regular basis for any breaks in the fence and security alarms to be considered.
10. Fire-fighting equipment in proportion to the fire risk that is presented by the type of materials used on site is to be available and kept in good operating order at all times.
11. The access road surrounding the solar array area to act as a potential firebreak.
12. Maintenance procedures to include regular inspection of electrical connections.
13. Faulty solar panels or wiring to be replaced immediately.
14. Proper grounding of the electrical system to reduce the risk of fire.
15. Maintenance to be undertaken in accordance with the manufacturer's guide.
16. A Fire Management Plan be compiled and implemented.
17. Water sample testing to be done annually to test the water quality and determine if any pollution is coming from the solar farm. If any pollution is found and is associated with the solar farm, then the developer is responsible to correct the pollution.
18. If work needs to be undertaken on the perimeter fence then the neighbouring landowners to be notified.

Procedure: Employment

1. Up skilling of local labour to skilled positions.

Procedure: Existing Services and Infrastructure

1. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure and Renewable Energy Generation Plant Setbacks to Eskom Infrastructure per **Appendix 5**.

Targets

1. All equipment maintained and operated per manufacturer's guide.
2. No fires.

Responsibility

Developer

4.7.4 Stormwater Management and Erosion Prevention

Objective

Poor drainage management can lead to damage or destruction of the rehabilitation investment.

Aspects

1. An increase in bare ground results in an increase in stormwater / surface water flow which may cause erosion.

Procedure

1. Erosion control measures must be maintained.
2. No access, maintenance activities or stockpiling to occur within 32 m of the drainage line or within steep terrain.
3. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised.
4. Sedimentation into drainage lines must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas.

Targets

1. Controlling and prevention of soil erosion.
2. Stormwater drainage.
3. Post-construction stormwater run-off not to exceed pre-construction stormwater run-off.

Responsibility

Developer

4.7.5 Solid and Liquid Waste Management

Objective

1. To limit the potential for groundwater and surface water pollution as well as the visible and malodorous accumulation of waste materials.
2. To prevent littering and associated environmental impacts.
3. Limit the amount of waste to be disposed of at a landfill.

Aspects

1. If waste is not disposed of correctly, there is a possibility that waste may be blown into the surrounding environment or being illegally disposed of

Procedure

1. Waste storage and collection must comply with the National Domestic Waste Collection Standards (21 January 2011) and Norms and Standards for the Storage of Waste, GN 926 of 29 November 2013.
2. Waste to be sorted and recycled where possible. A register of waste disposal (including waste manifests) and sorting records must be retained for auditing purposes.
3. No hazardous waste material to be disposed of as general waste.
4. No illegal dumping, burying or burning of waste allowed.
5. Oil-based liquids should be treated and disposed of as hazardous waste.
6. Broken, cracked or aged solar panels are to be replaced immediately.
7. Decommissioned, faulty or broken solar panels, equipment or cabling is to be taken off site and recycled. If items are unable to be recycled, to be disposed of at an appropriate landfill site.
8. Chemical toilets to be utilised during the maintenance periods and proof of disposal is required to be kept for auditing purposes.
9. Borehole water sample testing to be done annually for an agreed period, to test the water quality and determine if any pollution is coming from the solar farm. If any pollution is found and is associated with the solar farm, then the developer is responsible to correct the pollution.

Targets

Compliance with the National Environmental Management: Waste Act (Act 59 of 2008) and associated regulations (e.g. Norms and Standards for the Storage of Waste, GN 926 of 29 November 2013)

Responsibility

Developer

4.7.6 Traffic Management

Objective

Potential increases in traffic within the area, with resultant potential congestion, road damage, road safety, noise, etc. issues.

Aspects

1. Increased traffic on local roads, etc.
2. Traffic safety impact due to additional traffic.
3. Deterioration of public road network.

Procedure

1. Vehicles are to keep to the speed limits.
2. Maintenance of road immediately after construction period.
3. Additional warning signage regarding sharp bends in road.
4. Vegetation is cleared on the DR01940 road verge at the entrance to the solar site.

Targets

No accidents.

No spillage of any material onto roads.

Responsibility

Developer

4.7.7 Noise Management

Objective

To avoid disturbing residents with particular reference to maintenance activities on the site.

Aspects

Maintenance activities and vehicle operation.

Procedure

1. Maintenance activities to be limited to weekdays between 07:00 and 17:00; and Saturdays until 13:00. No work is to be undertaken on Sundays or public holidays, unless there is an emergency situation.
2. Vehicles and machinery to be kept in good working order with the prescribed mufflers and silencers.

Targets

The Occupational Health and Safety Act 85 of 1993 stipulates that noise levels in excess of 85 dB (A) at 1 metre from equipment are not permitted.

Responsibility

Developer

4.7.8 Visual Management

Objective

Visual intrusion on neighbouring landowners and hikers in the Groendal Wilderness Area and Springs Local Nature Reserve.

Aspects

Solar array area consisting of the solar panels impacting on aesthetics and potential glinting of the sun off the solar panels.

Procedure

1. Shrubs and trees located on the boundary of the site should be left intact and not removed.
2. Area surrounding the solar array should be grassed with an indigenous grass species.
3. Additional trees to be planted along the property boundary for screening.

Targets

Minimise visual intrusion onto neighbouring property.

Responsibility

Resident Engineer, Contractor

4.8 Environmental Management after the Completion of Construction on a Specific Site (Decommissioning)

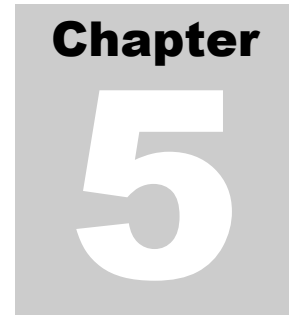
Environmental management associated with the termination of construction work on a specific site is:

1. All cleared areas are to be rehabilitated with indigenous vegetation suitable to the cleared area. There must be no signs of erosion.
2. All visible alien plants must be removed from disturbed sites and the disturbed site rehabilitated.
3. All recyclable rubble and waste, for example, scrap metal, bottles, cans and plastics are to be collected and disposed of through a registered recycling company.
4. All non-recyclable rubble and solid waste be collected and disposed of at a registered waste disposal facility. A register of waste disposal (including waste manifests) and sorting records must be retained for auditing purposes.

5. All concrete waste is to be removed, and the rubble disposed of at a permitted facility.
6. All access tracks not required for operations are to be covered and re-vegetated with indigenous grass, to match the existing vegetation as far as possible. An erosion control procedure must be established to ensure that the tracks are rehabilitated to satisfaction and that erosion does not become a problem.

4.9 Response to Public Complaints

The Resident Engineer or his representative must respond to queries and complaints from the public regarding construction activities within 14 days. In responding to such queries and / or complaints the Resident Engineer or his representative must document all such communications in a complaints register. All queries and complaints must be reported to the Developer. All remedial action taken on a complaint must be recorded in the complaints register. Refer to **Appendix 4** for a copy of the complaint form.

A grey square graphic containing the word "Chapter" in a bold, black, sans-serif font at the top, and a large, white, bold, sans-serif number "5" in the center.

Chapter 5: Environmental Management and Monitoring Requirements

5.1 Introduction

This chapter outlines the systems to ensure that the EMPr is effectively implemented, including monitoring requirements, corrective action, and auditing. The training, incentives and supporting documentation required to effect implementation of the EMPr are also described.

5.2 Environmental Compliance Monitoring

The Resident Engineer or his representative is responsible for monitoring the procedures and targets applicable to each environmental management requirement.

Environmental compliance audits are to be undertaken at least once a month by the ECO.

For each of the environmental management requirements, the following specific elements should be monitored. This list is intended as a guide and is not necessarily exhaustive; and consequently, other elements might need to be monitored to ensure compliance with the relevant target.

5.2.1 Restriction of Access to Sites

The Environmental Officer to inspect the demarcated area on a daily basis and inform the contractors of any violations or areas where markings must be replaced.

5.2.2 Flora and Fauna Management

1. All animal mortalities must be recorded and reported to the Resident Engineer or his representative.
2. A list of plants that are relocated and used in rehabilitation must be kept and their survival success documented.
3. Alien and noxious plant regrowth to be monitored and area to be kept free of alien invasive and noxious plants.

5.2.3 Cultural Historic, Archaeology and Palaeontology

During earthmoving, excavation and site rehabilitation the Environmental Officer must monitor for potential cultural historic, archaeological and palaeontological sites daily, or more frequently at his discretion.

5.2.4 Preservation of Topsoil

1. Daily checks, at the discretion of the Environmental Officer, need to be undertaken on the storage of the topsoil and the state of the vegetation or mulch covering the topsoil.
2. Checks on the erosion of the area must be carried out daily, and it must be ensured that the erosion minimisation measures installed are effective.

5.2.5 Air Quality

1. Dust must be visually monitored on a daily basis, or more frequently in conditions conducive to dust generation, as determined by the Environmental Officer.
2. The Environmental Officer must implement a formal dust monitoring programme and dust suppression techniques be revised, if persistent complaints are recorded.

5.2.6 Noise and Vibrations

1. The Environmental Officer must subjectively monitor noise and vibration levels on a frequent basis.
2. The Environmental Officer must implement a formal noise-monitoring programme if persistent complaints are recorded.

5.2.7 Water Consumption

Daily consumption of water must be monitored and recorded against the set water quota. Any excessive usage or peaks must be investigated.

5.2.8 Water Quality

1. The Environmental Officer must visually inspect runoff basins, drainage ditches and sediment traps on a daily basis to ensure that they are in an acceptable condition.
2. Other potential sources of surface and groundwater pollution must be inspected daily.

5.2.9 Waste Management and Site Housekeeping

1. The Environmental Officer must inspect on-site waste disposal facilities / temporary storage areas daily, to ensure that they are sufficient and that they are properly maintained.
2. During site inspections the Environmental Officer must check for waste material, which is inappropriately (temporarily) disposed of or stored.
3. A record must be kept of waste that is disposed of at the landfill site.
4. The Environmental Officer must monitor the site for litter and other waste material.

5.2.10 Fuel and Hazardous Materials Management

1. The Environmental Officer must ensure that materials are stored in the designated area set aside for that purpose.
2. During daily site inspections the Environmental Officer must check storage facilities to ensure that they are in a proper state of repair.
3. A record must be kept of any spills and what follow-up action was taken.

5.2.11 Social Issues

The Environmental Officer must monitor the site regularly (as part of daily inspections) and be alert to potential social problems on and off site.

5.2.12 Site Rehabilitation

1. The Environmental Officer must monitor site landscaping, re-vegetation and alien plant regrowth, commencing after construction.
2. Monitor the erosion control measures.

5.3 Corrective and Preventive Action / Management of Environmental Problems

The ECO must devise a Corrective Action Procedure for implementing corrective and preventive action. The Corrective Action Procedure is to be implemented by all contractors and subcontractors on site.

This system should:

- a) Report non-compliance with procedures or targets identified during monitoring and inspections (on Incident Forms, **Appendix 4**).
- b) Report other failures creating environmental problems.
- c) Report imminent non-compliance and potential environmental problems.
- d) Through the Resident Engineer or his representative delegate responsibility for corrective and preventive action.
- e) Document the resolution of the reported non-compliance or environmental problem.
- f) Impose disciplinary action where persistent non-compliance occurs.

Where possible, the Environmental Corrective Action Procedure should be integrated with the Quality, Health, Safety and, possibly, Maintenance, Corrective Action Procedures.

All contractors and sub-contractors must retain copies of the Corrective Action Procedure and other appropriate documentation and submit copies of all documentation to the Resident Engineer or his representative at a frequency to be determined by the Resident Engineer or his representative. The Resident Engineer or his representative must report to the Developer on a monthly basis on the implementation of the EMPr.

5.4 Documentation

The ECO and Resident Engineer or his representative must devise forms (i.e. pro forma) for:

- a) Daily, weekly and monthly (or as appropriate) monitoring of environmental management requirements and targets (these should be integrated with those for Quality, Health, Safety and, possibly, Maintenance).
- b) Noncompliance (time, offender), including a register of "offenders".
- c) Recommended corrective action.
- d) Resolution of noncompliance problems.
- e) Method Statements.
- f) Logging complaints received in a complaints register.

- g) Evaluating the environmental awareness training programme.
- h) Evaluating the job-specific environmental training programmes.
- i) Auditing of activities.

These records are to be made available for review by the Developer. The Resident Engineer or his representative, Contractor and sub-contractors must keep a record of all meetings attended, waste disposal documents, audits undertaken and other environmental issues as appropriate.

5.5 Environmental Awareness Training

The Contractors and the Resident Engineer or his representative are responsible for ensuring that all personnel have a general environmental awareness as well as specific knowledge of the potential environmental impacts associated with their work activities. All personnel associated with the project must understand the purpose and benefits of the EMP. The appropriate training must occur as part of an induction programme, i.e. before commencing on-site work, and should also focus on the benefits of sound environmental management.

Specific elements of environmental awareness training should include (list is not intended to be exclusive or exhaustive):

1. Ability to recognise archaeological and palaeontological artefacts.
2. Awareness on the importance of site rehabilitation.
3. Management and minimising of waste, including waste separation. Instruction in temporary waste storage and disposal systems and facilities.
4. Water conservation and water quality protection.
5. Awareness of existing social problems in the area.
6. Incentives and rewards for good environmental practice.
7. Instruction in erosion control measures.
8. Acceptable behaviour with regard to flora and fauna.
9. Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, and other chemicals.
10. Responsible handling of chemicals and spills.
11. Environmental emergency procedures and incident reporting.

In the event that new personnel are brought onto site by the Contractor during the project, these personnel are to undergo environmental awareness training prior to any work being undertaken. The Contractor is to include environmental awareness training in the toolbox talks on a monthly basis.

The Resident Engineer or his representative must devise a system (including appropriate records) to evaluate the training programme and recommend changes as appropriate (e.g. to coincide with the phasing of construction activities and re-training in areas of high rates of non-compliance).

5.6 Environmental Administration Matters

5.6.1 Penalties

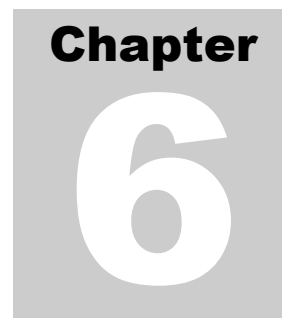
Transgressions relate to actions by the Contractor, Sub-contractor or Contractor team member whereby damage or harm is inflicted upon the environment or any feature of the environment and where any of the conditions or specifications of the EMPr are infringed upon.

In the instance of environmental damage, the damage, where possible, is to be repaired and rehabilitated using appropriate measures, as specified and undertaken by appropriate specialists, for the account of the Contractor or other guilty party.

Where infringement of the specifications or conditions of the EMPr is registered, appropriate remedial action or measures are to be implemented for the account of the Contractor. Where non-repairable damage is inflicted upon the environment or non-compliance with any of the EMPr conditions is registered, the Contractor may face a monetary penalty to an amount specified by the ECO in conjunction with the Resident Engineer or his representative. A first offence warning may be implemented.

5.6.2 Incentives

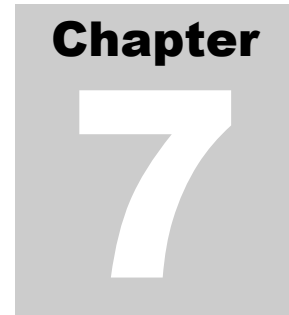
Where commendable performance by a Contractor, Sub-contractor or team member is noted for work undertaken on site, in particular with regard to compliance with the specifications of the EMPr, the ECO in conjunction with the Resident Engineer or his representative may issue an Environmental Performance Certificate to the individual or team which has earned such recognition.



Chapter 6: Glossary of Terms

| Term | Explanation |
|---|--|
| Ambient (air) | Current surrounding atmospheric condition |
| dB(A) (decibels A-scale) | A frequency-weighted noise unit used for traffic and industrial noise measurement |
| Environment | The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation |
| Environmental Aspect | An element of an organisation's activities, products or services that can interact with the environment |
| Environmental Control Officer | An independent person who is responsible for undertaking site inspections to audit and report on compliance with environmental specifications with the Environmental Management Programme. |
| Environmental Impact | Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services |
| Environmental Impact Assessment (EIA) | A study of the environmental consequences of a proposed course of action. An environmental evaluation or assessment is a study of the environmental effects of a decision, activity or undertaking. It is most often used within an IEM Planning process as a decision support tool to compare different options |
| Environmental Management Programme (EMPr) | A tool used to prescribe management mechanisms or methods for the prevention of undue or reasonably avoidable adverse environmental impacts and for the enhancement of the positive environmental benefits of a development. |
| Environmental Management System | The part of the overall management system that includes organisational structure, Planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy |
| Exotic | Any Plant species not falling under the indigenous definition. |

| Term | Explanation |
|---|---|
| Integrated Environmental Management (IEM) | A process that involves the authorities and public, and integrates environmental issues with all aspects of planning* |
| Invasive | Tending to displace, or increase in cover relative to, surrounding vegetation. |
| Palaeontology | (study of) life in geological past |



Chapter 7: References

Department of Environment Affairs and Tourism. 1997. Guidelines for Comprehensive Environmental Impact Reports. Unpublished Memorandum.

Department of Environment Affairs. The integrated environmental management procedure. Guideline document 1, Department of Environment Affairs, Pretoria, 1992, p 19.

Draft Basic Assessment Report: Proposed SACE Ranger Solar PV (2.46MW) Plant, Uitenhage, Eastern Cape. August 2014.

Environmental Management Plans, Integrated Environmental Management, Information Series 12, Department of Environmental Affairs (DEA), Pretoria.

National Environmental Management Act 107 of 1998 (NEMA).

Appendix 1: Declared Weeds and Invader Programmetts

Extracts from GNR.1048 of 25 May 1984: Regulations (Department Of Agriculture) as amended Notice *Government Gazette* R.2687 10029 6 December 1985 and R.280 22166 30 March 2001

WEEDS AND INVADER PLANTS

15. Declaration of weeds and invader Plants

- (1) Plants of the kinds specified in column 1 of Table 3 as category 1 Plants are hereby declared weeds to the extent indicated in column 3 of the said Table opposite the names of the respective kinds of Plants.
- (2) Plants of the kinds specified in column 1 of Table 3 as category 2 Plants and as category 3 Plants are hereby declared invader Plants to the extent indicated in column 3 of the said Table opposite the names of the respective kinds of Plants.

(Regulation 15 substituted by GNR.280 of 2001.)

15A Combating of category 1 Plants

- (1) Category 1 Plants may not occur on any land or inland water surface other than in biological control reserves.
- (2) A land user shall control any category 1 Plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
- (3) No person shall, except in or for purposes of a biological control reserve:
 - (a) establish, Programmet, maintain, multiply or propagate category 1 Plants;
 - (b) import or sell propagating material of category 1 Plants or any category 1 Plants;
 - (c) acquire propagating material of category 1 Plants or any category 1 Plants.
- (4) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with the requirements of sub-regulation (1) on such conditions as the executive officer may determine in each case.

(Regulation 15A inserted by GNR.280 of 2001.)

15B Combating of category 2 Plants

(1) Category 2 Plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.

(2)(a) The executive officer may on application in writing demarcate an area as an area where category 2 Plants may occur, be established and be maintained.

An area in respect of which a water use licence for stream flow reduction activities has been issued in terms of section 36 of the National Water Act, 1998 (Act No. 36 of 1998) shall be deemed to be a demarcated area.

(3) The executive officer shall demarcate an area for the occurrence, establishment and maintenance of category 2 Plants only if:

(a) the category 2 Plants in the area are cultivated under controlled circumstances; and

(b) the land user concerned has been authorised to use water in terms of the National Water Act, 1998 (Act No. 36 of 1998); and

(c) the category 2 Plants or products of category 2 Plants in the area are demonstrated to primarily serve a commercial purpose, use as a woodlot, shelter belt, building material, animal fodder, soil stabilisation, medicinal or other beneficial function that the executive officer may approve; and

(d) all reasonable steps are taken to curtail the spreading of propagating material of the category 2 Plants outside the demarcated areas.

(4) When an area is demarcated for the occurrence, establishment and maintenance of category 2 Plants the executive officer may impose such additional conditions as may reasonably be deemed necessary to keep the category 2 Plants in the area in check.

(5) No person shall sell propagating material of category 2 Plants or any category 2 Plants to another person unless such other person is a land user of a demarcated area or of a biological control reserve.

(6) No person shall acquire propagating material of category 2 Plants or any category 2 Plants unless such material or such Plants are intended for use in a demarcated area or in a biological control reserve.

(7) Propagating material of category 2 Plants or category 2 Plants shall only be imported or sold in accordance with the provisions of the Programme Improvement Act, 1976 (Act No. 53 of 1976), the Agricultural Pests Act, 1983 (Act No. 36 of 1983) and the environment conservation regulations.

- (8) A land user shall control any category 2 Plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
- (9) Unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow category 2 Plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
- (10) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-regulations (1), (3), (5), (6), (8) and (9) on such conditions as the executive officer may determine in each case.

(Regulation 15B inserted by GNR.280 of 2001.)

15C Combating of category 3 Plants

- (1) Category 3 Plants shall not occur on any land or inland water surface other than in a biological control reserve.
- (2) Subject to the provisions of sub-regulation (3), the provisions of sub-regulation (1) shall not apply in respect of category 3 Plants already in existence at the time of the commencement of these regulations.
- (3) (a) No land user shall allow category 3 Plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
(b) The executive officer may impose such additional conditions as may reasonably be deemed necessary with regard to category 3 Plants already in existence at the time of the commencement of these regulations.
(c) A land user must take all reasonable steps to curtail the spreading of propagating material of category 3 Plants.
(d) The executive officer may, after consultation with the land user, issue a direction in terms of section 7 of the Act that category 3 Plants in existence at the time of the commencement of these regulations must be controlled by means of the measures prescribed in regulation 15F.
- (4) No person shall, except in or for purposes of a biological control reserve:
 - (a) Programmet, establish, maintain, multiply or propagate category 3 Plants;
 - (b) import or sell propagating material of category 3 Plants or any category 3 Plants;
 - (c) acquire propagating material of category 3 Plants or any category 3 Plants.
- (5) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-

regulations (1), (3) and (4) on such conditions as the executive officer may determine in each case.

(Regulation 15C inserted by GNR.280 of 2001.)

15D Designation of biological control reserves

- (1) The executive officer may on application in writing designate an area as a biological control reserve.
- (2) The executive officer shall designate an area as a biological control reserve only if:
 - (a) the area concerned is used for the breeding of biological control agents by a biological control expert; and
 - (b) no other measures that may destroy or render the biological control ineffective are applied in that area; and
 - (c) the area concerned serves as a refuge from where biological control agents can move or be distributed to other infestations of category 1, 2 and 3 Plants.

(Regulation 15D inserted by GNR.280 of 2001.)

15E Methods of control

- (1) Where category 1, 2 or 3 Plants occur contrary to the provisions of these regulations, a land user shall control such Plants by means of one or more of the following methods of control as is appropriate for the species concerned and the ecosystem in which it occurs:
 - (a) uprooting, felling, cutting or burning;
 - (b) treatment with a weed killer that is registered for use in connection with such Plants in accordance with the directions for the use of such a weed killer;
 - (c) biological control carried out in accordance with the stipulations of the Agricultural Pests Act, 1983 (Act No. 38 of 1983), the Environment Conservation Act, 1989 (Act No. 73 of 1989) and any other applicable legislation;
 - (d) any other method of treatment recognised by the executive officer that has as its object the control of the Plants concerned, subject to the provisions of sub-regulation (4);
 - (e) a combination of one or more of the methods prescribed in paragraphs (a), (b), (c), and (d), save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.

- (2) The methods contemplated in sub-regulation (1) shall also be applied with regard to the propagating material and the re-growth of category 1, 2 and 3 Plants in order to prevent such Plants from forming seed or re-establishing in any manner.
- (3) The performance of an act of control is not in itself proof that the objects of the control methods have been achieved and follow-up operations are mandatory to achieve the appropriate level of combating.
- (4) Where uncertainty exists about the presence or efficacy of any biological control agent, a biological control expert shall be consulted.
- (5) Any action taken to control category 1, 2 and 3 Plants shall be executed with caution and in a manner that will cause the least possible damage to the environment.

(Regulation 15D inserted by GNR.280 of 2001.)

15F Application of other laws

Nothing contained in this regulation shall derogate in any way from any obligation imposed on any land user in term of any other law.

16. Indicators of bush encroachment

- (1) Indigenous Plants of the kinds specified in column 1 of Table 4 are regarded as indicator Plants indicating bush encroachment in the areas specified in column 2 of the said Table opposite the names of the respective kinds of Plants.
- (2) A land user of an area in which natural vegetation occurs and that contains communities of indicator Plants shall follow practices to prevent the deterioration of natural resources and to combat bush encroachment where it occurs.
- (3) One or more of the following practices shall be followed with regard to communities of indicator Plants contemplated in sub-regulation (2) in order to remove the cause of the deterioration of the natural resources and to improve and maintain the production potential of the natural pastoral land:
 - (a) uprooting, felling or cutting;
 - (b) treatment with a weed killer that is registered for use in connection with such Plants in accordance with the directions for the use of such a weed killer;
 - (c) the application of control measures regarding the utilisation and protection of veld in terms of regulation 9;
 - (d) the application of control measures regarding livestock reduction or removal of animals in terms of regulations 10 and 11;
 - (e) any other method or strategy that may be applicable and that is specified by the executive officer by means of a directive.

(Regulation 16 substituted by GNR.280 of 2001.)

➤ **Table 8: Declared Weeds And Invader Plants**

| Soort plant / Kind of plant | | Type / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|---|--------------------------------------|---------------------|---------------------|--|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| Kolom 1 / Column 1 | | Kolom 2 / Column 2 | Kolom 3 / Column 3 | Kolom 4 / Column 4 |
| <i>Acacia baileyana</i> F. Muell. | Bailey-se-wattel / Bailey's wattle | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Acacia cyclops</i> A. Cunn. ex G. Don | Rooikrans / Red eye | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Acacia dealbata</i> Link | Silwerwattel / Silver wattle | Indringer / Invader | 2 | Kategorie 1 plant in Wes-Kaap/ Category 1 plant in Western Cape Kyk / See subreg. 15.C(7)(c) |
| <i>Acacia decurrens</i> (J.C. Wendl.) Willd. | Groenwattel / Green wattle | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Acacia elata</i> A. Cunn. ex Benth. (<i>A. terminalis</i> misapplied in S.A.) | Peperboomwattel / Pepper tree wattle | Indringer / Invader | 3 | |
| <i>Acacia implexa</i> Benth. | Screw-pod wattle | Onkruid / Weed | 1 | |
| <i>Acacia longifolia</i> (Andr.) Willd. | Langblaarwattel / Long-leaved wattle | Onkruid / Weed | 1 | |
| <i>Acacia mearnsii</i> De Wild. | Swartwattel / Black wattle | Indringer / Invader | 2 | Kategorie 1 plant in Suid Afrika, behalwe KwaZulu-Natal en Mpumalanga waar dit kommersieël verbou word / Category 1 plant South Africa, except in KwaZulu-Natal and Mpumalanga where it is used commercially |
| <i>Acacia melanoxylon</i> R. Br. | Australiese swarthout / | Indringer / | 2 | Kyk / See subreg. |

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| Soort plant / Kind of plant | | Type / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|--|---|---------------------|---------------------|---|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| | Australian blackwood | Invader | | 15.C(7)(c) |
| <i>Acacia paradoxa</i> DC. (= <i>A. armata</i> R. Br.) | Kangaroo wattle | Onkruid / Weed | 1 | |
| <i>Acacia podalyriifolia</i> A Cunn. | Vaalmimosa / Pearl acacia | Indringer / Invader | 3 | |
| <i>Acacia pycnantha</i> Benth. | Gouewattel / Golden wattle | Onkruid / Weeds | 1 | |
| <i>Acacia saligna</i> (Labill.) H.L. Wendl. | Port Jackson / Port Jackson willow | Onkruid / Weeds | 1 | |
| <i>Agave sisalana</i> Perrine | Garingboom / Sisal hemp, Sisal | Indringer / Invader | 2 | |
| <i>Alhagi maurorum</i> Medik. (= <i>A. camelorum</i> Fisch.) | Kameeldoringbos / Camel thorn bush | Onkruid / Weed | 1 | |
| <i>Anredera cordifolia</i> (Tenore) Steen. { <i>A. baselloides</i> (H.B.K.) Baill. Misapplied in South Africa} | Madeira vine, Bridal wreath | Onkruid / Weed | 1 | |
| <i>Araujia sericifera</i> Brot. | Motvanger / Moth catcher | Onkruid / Weed | 1 | |
| <i>Argemone ochroleuca</i> Sweet subsp. <i>ochroleuca</i> | Witblom bloudissel / White flowered Mexican poppy | Onkruid / Weed | 1 | |
| <i>Arundo donax</i> L. | Spaanse riet / Giant reed, Spanish reed | Indringer / Invader | 3 | |
| <i>Atriplex lindleyi</i> Moq. subsp. <i>inflata</i> Wilson (Muell.) | Blasiesoutbos / Sponge-fruit saltbush | Indringer / Invader | 3 | |
| <i>Atriplex nummularia</i> Lindley subsp. <i>Nummularia</i> | Oumansoutbos / Old man saltbush | Indringer / Invader | 2 | |
| <i>Azolla filiculoides</i> Lam. | Rooiwatervaring / Azolla, Red water fern | Onkruid / Weeds | 1 | Kyk / See subreg. 15.C(7)(c) |
| <i>Caesalpinia decapetala</i> (Roth) Alston (= <i>C. sepiaria</i> Roxb.) | Kraaldoring / Mauritius thorn | Onkruid / Weed | 1 | |
| <i>Campuloclinium macrocephalum</i> (Less.) DC. (= <i>Eupatorium</i> | | Onkruid / Weed | 1 | |

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| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|--|--|---------------------|---------------------|--|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| <i>macrocephalum</i> Less.) | | | | |
| <i>Cannabis sativa</i> L. | Slegs hemp, nie dagga nie / Hemp only, not dagga | Indringer./ Invader | 2 | Beheerde aanplanting/ Controlled cultivation |
| <i>Cardaria draba</i> (L.) Desv. | Peperbos / Pepper-cress, Hoary cardaria, White top | Onkruid / Weed | 1 | |
| <i>Cardiospermum grandiflorum</i> Swartz | Blaasklimop / Balloon vine | Onkruid / Weed | 1 | |
| <i>Casuarina cunninghamiana</i> Miq. | Kasuarisboom / Beefwood | Indringer / Invader | 2 | Slegs vir gebruik as windbrekers en nie vir duin stabilisasie nie/ Only for use as windbreakers, not for dune stabilisation |
| <i>Casuarina equisetifolia</i> L. | Perdestertboom / Horsetail tree | Indringer / Invader | 2 | Slegs vir gebruik as windbrekers en nie vir duin stabilisasie nie / Only for use as windbreakers, not for dune stabilisation |
| <i>Cereus jamacaru</i> DC. (<i>C. peruvianus</i> misapplied in S.A) | Nagblom / Queen of the Night | Onkruid / Weed | 1 | |
| <i>Cestrum aurantiacum</i> Lindl. | Oranjecestrum / Yellow or Orange cestrum | Onkruid / Weed | 1 | |
| <i>Cestrum laevigatum</i> Schlecht. | Inkbessie / Inkberry | Onkruid / Weed | 1 | |
| <i>Cestrum parqui</i> L'Hérit | Inkbessie / Chilean cestrum | Onkruid / Weed | 1 | |
| <i>Chromolaena odorata</i> (L.) R.M. King & H. Robinson (= <i>Eupatorium odoratum</i> L.) | Paraffienbos, Chromolaena / Triffid weed, Chromolaena | Onkruid / Weed | 1 | |
| <i>Cirsium vulgare</i> (Savi) Ten. (= <i>C. lanceolatum</i> Scop.) | Skotse dissel, Speerdissel / Scotch thistle, Spear thistle | Onkruid / Weed | 1 | |
| <i>Convolvulus arvensis</i> L. | Akkerwinde, Klimop / Field | Onkruid / | 1 | |

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| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|---|---|---------------------|---------------------|---|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| | bindweed, Wild morning-glory | Weed | | |
| <i>Cortaderia jubata</i> (Lem.) Stapf | Pampasgras / Pampas grass | Onkruid / Weed | 1 | |
| <i>Cortaderia selloana</i> (Schult.) Aschers. & Graebn. | Pampasgras, Silwergras / Pampas grass | Onkruid / Weed | 1 | |
| <i>Cotoneaster franchetii</i> Bois. | Dwergmispel / Cotoneasters | Indringer / Invader | 3 | |
| <i>Cotoneaster pannosus</i> Franch. | Silwerdwergmispel / Silver-leaf cotoneaster | Indringer / Invader | 3 | |
| <i>Cuscuta campestris</i> Yunck. | Gewone dodder / Common dodder | Onkruid / Weed | 1 | |
| <i>Cuscuta suaveolens</i> Ser. | Luserndodder / Lucerne dodder | Onkruid / Weed | 1 | |
| <i>Cytisus monspessulanus</i> L. (= <i>C. candicans</i> (L.) DC., <i>Genista monspessulana</i> (L.) L. Johnson) | Montpellier broom | Onkruid / Weed | 1 | |
| <i>Datura ferox</i> L. | Grootstinkblaar / Large thorn apple | Onkruid / Weed | 1 | |
| <i>Datura innoxia</i> Mill. | Harige stinkblaar / Downy thorn apple | Onkruid / Weed | 1 | |
| <i>Datura stramonium</i> L. | Gewone stinkblaar / Common thorn apple | Onkruid / Weed | 1 | |
| <i>Echinopsis spachiana</i> (Lem.) Fiedr. & Rowley (= <i>Trichocereus spachianus</i> (Lem.) Riccob.) | Orrelkaktus / Torch cactus | Onkruid / Weed | 1 | |
| <i>Echium plantagineum</i> L. (= <i>E. lycopsis</i> L.) | Pers echium / Patterson's curse | Onkruid / Weed | 1 | |
| <i>Echium vulgare</i> L. | Blou – echium / Blue echium | Onkruid / Weed | 1 | |
| <i>Egeria densa</i> Planch. (= <i>Elodea densa</i> (Planch.) Casp.) | Waterpes / Ditch moss, Water thyme | Onkruid / Weed | 1 | |
| <i>Eichhornia crassipes</i> (Mart.) Solms-Laub. | Waterhiasint / Water Hyacinth | Onkruid / Weed | 1 | |
| <i>Elodea canadensis</i> Michaux | Canadian water weed | Onkruid / Weed | 1 | |

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| Soort plant / Kind of plant | | Type / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|--|---|---------------------|---------------------|--|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| <i>Eucalyptus camaldulensis</i> Dehnh. | Rooibloekom / Red river gum | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Eucalyptus cladocalyx</i> F. Muell. | Suikerbloekom / Sugar gum | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Eucalyptus grandis</i> Hill ex Maid (<i>E. saligna</i> Sm. (p.p.)) | Salignabloekom / Saligna gum, Rose gum | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Eucalyptus lehmannii</i> (Schauer) Benth. | Spinnekopbloekom / Spider gum | Indringer / Invader | 3 | |
| <i>Eucalyptus paniculata</i> Sm. | Gryssterbasbloekom / Grey ironbark | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Eucalyptus sideroxylon</i> A. Cunn. ex Woolls | Swartsterbasbloekom / Black ironbark, Red ronbark | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Gleditsia triacanthos</i> L. | Amerikaanse dieldoring, Soetpeulboom / Honey locust, Sweet locust | Indringer / Invader | 2 | |
| <i>Hakea drupacea</i> (Gaertn.f) Roemer & Schultes (= <i>H. suaveolens</i> R. Br.) | Soethakea / Sweet hakea | Onkruid / Weed | 1 | |
| <i>Hakea gibbosa</i> (Sm.) Cav. | Harige hakea / Rock hakea | Onkruid / Weed | 1 | |
| <i>Hakea sericea</i> Schrad. | Syerige hakea / Silky hakea | Onkruid / Weed | 1 | |
| <i>Harrisia martinii</i> (Lab.) Britton | Toukaktus, <i>Harrisia</i> kaktus / Moon cactus, <i>Harrisia</i> cactus | Onkruid / Weed | 1 | |
| <i>Hypericum perforatum</i> L. | Johanneskruid / St. John's wort, Tipton weed | Indringer / Invader | 2 | Beheerde aanplanting/ Controlled cultivation |
| <i>Ipomoea indica</i> (Burm.f.) Merr. (= <i>I. Congesta</i> R. Br.) | Purperwinde / Morning glory | Indringer / Invader | 3 | |
| <i>Ipomoea purpurea</i> (L.) Roth | Purperwinde / Morning glory | Indringer / Invader | 3 | ? |
| <i>Jacaranda mimosifolia</i> D. Don | Jakaranda / Jacaranda | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Lantana camara</i> L. en enige | Lantana / Lantana, Tickberry | Onkruid / | 1 | |

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| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|---|--|---------------------|---------------------|---|
| <i>Botaniese naam / Botanical name</i> | <i>Gewone naam / Common name</i> | | | |
| entiteit wat deels of geheel ontstaan het uit die <i>Lantana camara</i> kompleks deur verbastering of seleksie op natuurlike of kunsmatige wyse / and any entity which has partly or wholly been derived from the <i>Lantana camara</i> complex by means of hybridisation or selection under natural or artificial conditions | | Weed | | |
| <i>Leptospermum laevigatum</i> (Gaertn.) F. Muell. | Australiese mirt / Australian myrtle | Onkruid / Weed | 1 | |
| <i>Leucaena leucocephala</i> (Lam.) De Wit | Reuse wattel / Leucaena | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Ligustrum japonicum</i> Thunb. | Japanese liguster / Japanese wax – leaved privet | Indringer / Invader | 3 | |
| <i>Ligustrum lucidum</i> Ait. | Chinese liguster / Chinese wax – leaved privet | Indringer / Invader | 3 | |
| <i>Ligustrum ovalifolium</i> Hassk. | Kaliforniese liguster / Californian privet | Indringer / Invader | 3 | |
| <i>Ligustrum sinense</i> Lour. | Chinese liguster / Chinese privet | Indringer / Invader | 3 | |
| <i>Ligustrum vulgare</i> L. | Gewone liguster / Common privet | Indringer / Invader | 3 | |
| <i>Litsea glutinosa</i> (Lour.) C.B. Robinson (= <i>L. sebifera</i> Pers.) | Indiese lourier / Indian laurel | Onkruid / Weed | 1 | |
| <i>Lythrum salicaria</i> L. | Purple loosestrife | Onkruid / Weed | 1 | |
| <i>Macfadyena unguis-cati</i> (L.) A. Gentry | Katteklouranker / Cat's claw creeper | Onkruid / Weed | 1 | |
| <i>Melia azedarach</i> L. | Maksering, Bessieboom / "Syringa", Persian lilac | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Metrosideros excelsa</i> Soland. Ex. Gaertn. (= <i>M. tomentosa</i> A. Rich.) | Nieu-Seelandse perdestert / New Zealand bottle brush | Indringer / Invader | 3 | |

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| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|--|---|---------------------|---------------------|--|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| <i>Mimosa pigra</i> L. | Giant sensitive plant | Onkruid / Weed | 1 | |
| <i>Morus alba</i> L. | Witmoerbeï, Gewone moerbeï / White mulberry, Common mulberry | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Myoporum tenuifolium</i> Forst. F. (<i>M. acuminatum</i> misapplied in S.A.) | Manatoka | Indringer / Invader | 2 | |
| <i>Myriophyllum aquaticum</i> (Vell.) Verdc. | Waterduisendblaar / Parrot's feather | Onkruid / Weed | 1 | |
| <i>Myriophyllum spicatum</i> L. | Spiked water-milfoil | Onkruid / Weed | 1 | |
| <i>Nassella tenuissima</i> (Trin.) Barkworth (= <i>Stipa tenuissima</i> Trin.) | Witpolgras / White tussock | Onkruid / Weed | 1 | |
| <i>Nassella trichotoma</i> (Nees) Hack. ex Arech. (= <i>Stipa trichotoma</i> Nees) | Nassella polgras / Nassella tussock | Onkruid / Weed | 1 | |
| <i>Nerium oleander</i> L. | Selonsroos / Oleander | Onkruid / Weed | 1 | Steriele kultivars uitgesluit / Excluding sterile, double-flowered cultivars |
| <i>Nicotiana glauca</i> R.C. Grah. | Wildetabak / Wild tobacco | Onkruid / Weed | 1 | |
| <i>Opuntia aurantiaca</i> Lindl. | Litjieskaktus / Jointed cactus | Onkruid / Weed | 1 | |
| <i>Opuntia exaltata</i> Berger | Langdoringkaktus / Long spine cactus | Onkruid / Weed | 1 | |
| <i>Opuntia ficus-indica</i> (L.) Mill. | Boereturksvy, Grootdoringturksvy / Mission prickly pear, Sweet prickly pear | Onkruid / Weed | 1 | Uitgesonderd alle doringlose kultivars en seleksies / Excluding all spineless cultivars and selections |
| <i>Opuntia humifusa</i> (Raf.) Raf. (= <i>O. compressa</i> (Salisb.) | Large flowered prickly pear, Creeping prickly pear | Onkruid / Weed | 1 | |

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| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|---|--|---------------------|---------------------|---|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| (Macbride) | | | | |
| <i>Opuntia imbricata</i> (Haw.) DC. {= <i>Cylindropuntia imbricata</i> (Haw.) Knuth} | Imbrikkaktus, Kabelturksvy / Imbricate cactus, Imbricate prickly pear | Onkruid / Weed | 1 | |
| <i>Opuntia lindheimeri</i> Engelm. | Klein rondeblaarturksvy / Small round-leaved prickly pear | Onkruid / Weed | 1 | |
| <i>Opuntia monacantha</i> Haw. (= <i>O vulgaris</i> Mill.) | Suurturksvy, Luisiesturksvy / Cochineal prickly pear, Drooping prickly pear | Onkruid / Weed | 1 | |
| <i>Opuntia rosea</i> DC. | Roseakaktus / Rosea cactus | Onkruid / Weed | 1 | |
| <i>Opuntia spinulifera</i> Salm-Dyck | Blouturksvy, Groot rondebelaar turksvy / Saucepan cactus, Large roundleaved prickly pear | Onkruid / Weed | 1 | |
| <i>Opuntia stricta</i> (Haw.) Haw. | Suurturksvy / Pest pear of Australia | Onkruid / Weed | 1 | |
| <i>Orobanche minor</i> Sutton | Klawerbesemraap, Bremraap / Lesser broomrape, Clover broomrape | Onkruid / Weed | 1 | |
| <i>Paraserianthes lophantha</i> (Willd.) Nielsen (= <i>Albizia lophantha</i> (Willd.) Benth.) | Australiese Albizia, stinkboon / Australian Albizia, Stink bean | Onkruid / Weed | 1 | |
| <i>Parthenium hysterophorus</i> L. | Parthenium | Onkruid / Weed | 1 | |
| <i>Passiflora coerulea</i> L. | Siergrenadella / Blue passion flower | Onkruid / Weed | 1 | |
| <i>Passiflora edulis</i> Sims | Grenadella / Purple granadilla, Passion fruit | Indringer / Invader | 2 | |
| <i>Pennisetum setaceum</i> (Forssk.) Chiov. | Pronkgras / Fountain grass | Onkruid / Weed | 1 | |
| <i>Pennisetum villosum</i> R. Br. ex Fresen. | Veergras / Feathertop | Onkruid / Weed | 1 | |
| <i>Pereskia aculeata</i> Mill. | Pereskia / Barbados gooseberry | Onkruid / Weed | 1 | |
| <i>Pinus elliotti</i> Engelm. | Basden / Slash pine | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Pinus halepensis</i> Mill. | Aleppoden / Aleppo pine | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Pinus patula</i> Schlecht. & Cham. | Treurden / Patula pine | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Pinus pinaster</i> Ait. | Trosden / Cluster pine | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Pinus radiata</i> D. Don | Radiataden / Radiata pine | Indringer / | 2 | Kyk / See subreg. |

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| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|--|---|---------------------|---------------------|--|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| | | Invader | | 15.C(7)(c) |
| <i>Pinus taeda</i> L. | Loblollyden / Loblolly pine | Indringer / Invader | 2 | Kyk / See subreg. 15.C(7)(c) |
| <i>Pistia stratiotes</i> L. | Waterslaai / Water lettuce | Onkruid / Weed | 1 | |
| <i>Pittosporum undulatum</i> Vent. | Australiese kasuur, Soet Pittosporum / Australian cheesewood, Sweet pittosporum | Onkruid / Weed | 1 | |
| <i>Pontederia cordata</i> L. | Pickerel weed | Indringer / Invader | 3 | Kategorie 1 in landelike gebiede / Category 1 in non-urban areas |
| <i>Populus alba</i> L. | Witpopulier / White poplar | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Populus deltoides</i> Bart. ex. Marsh | Vuurhoutjiepopulier / Match poplar | Indringer / Invader | 2 | |
| <i>Populus x canescens</i> (Ait.) J. E. Sm. | Vaalpopulier / Grey poplar | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Prosopis glandulosa</i> Torr. var <i>torreyana</i> (Benson) Johnston and hybrids / en hibriedes | Heuningprosopis / Honey mesquite | Indringer / Invader | 2 | |
| <i>Prosopis velutina</i> Wooton and hybrids / en hibriedes | Fluweelprosopis / Velvet mesquite | Indringer / Invader | 2 | |
| <i>Psidium guajava</i> L. and hybrids / en hibriedes | Koejawel / Guava | Indringer / Invader | 2 | |
| <i>Psidium guineense</i> Swartz | Brasiliaanse koejawel / Brazilian guava | Indringer / Invader | 3 | |
| <i>Psidium littorale</i> Raddi var <i>longipes</i> (O. Berg) Fosb. (= <i>P. cattleianum</i> Sab.) | Aarbeikoejawel / Strawberry guava | Indringer / Invader | 3 | |
| <i>Pueraria lobata</i> (Willd.) Ohwi | Kudzuranker / Kudzu vine | Onkruid / Weed | 1 | |
| <i>Pyracantha angustifolia</i> (Franch.) C.K. Schneid. | Geelbranddoring / Yellow firethorn | Indringer / Invader | 3 | |
| <i>Pyracantha crenulata</i> (D. Don) M.J. Roem. | Rooiuvurdoring / Himalayan firethorn | Indringer / Invader | 3 | |
| <i>Ricinus communis</i> L. | Kasterolieboom / Castor-oil plant | Indringer / Invader | 2 | |
| <i>Robinia pseudoacacia</i> L. | Witakasia / Black locust | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Rorippa nasturtium – aquaticum</i> (L.) Hayek (= <i>Nasturtium officinale</i> R. Br.) | Bronkors / Watercress | Indringer / Invader | 3 | |
| <i>Rosa rubiginosa</i> L. (= <i>R. eglanteria</i> L.) | Wilderoos / Eglantine, Sweetbriar | Indringer / Invader | 3 | |
| <i>Rubus cuneifolius</i> Pursh. and hybrid <i>R x proteus</i> C.H. Stirton | Amerikaanse braam, / American bramble | Onkruid / Weed | 1 | |
| <i>Rubus fruticosus</i> L. agg. | Braam / European blackberry | Indringer / | 2 | |

CEN Integrated Environmental Management Unit

| Soort plant / Kind of plant | | Tipe / Type | Kategorie/ Category | Spesiale voorwaardes / Special conditions |
|---|---|---------------------|---------------------|---|
| Botaniese naam / Botanical name | Gewone naam / Common name | | | |
| | | Invader | | |
| <i>Salix babylonica</i> L. | Treurwilger /Weeping willow | Indringer / Invader | 3 | |
| <i>Salix fragilis</i> L. | Crack or brittle willow | Onkruid / Weed | 1 | |
| <i>Salvinia molesta</i> D. S. Mitchell and other species of the Family Salviniaceae | Watervaring / Kariba weed | Onkruid / Weed | 1 | |
| <i>Schinus terebinthifolius</i> Raddi | Brasiliaanse peperboom / Brazilian pepper tree | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Sesbania punicea</i> (Cav.) Benth. | Rooi sesbania / Red sesbania | Onkruid / Weed | 1 | |
| <i>Solanum elaeagnifolium</i> Cav. | Satansbos / Silver-leaf bitter apple | Onkruid / Weed | 1 | |
| <i>Solanum mauritianum</i> Scop. | Luisboom / Bugweed | Onkruid / Weed | 1 | |
| <i>Solanum seaforthianum</i> Andr. | Aartappelranker / Potato creeper | Onkruid / Weed | 1 | |
| <i>Solanum sisymbriifolium</i> Lam. | Wildetamatie, Doringtamatie / Wild tomato, Dense-thorned bitter apple | Onkruid / Weed | 1 | |
| <i>Spartium junceum</i> L. | Spaanse besem / Spanish broom | Onkruid / Weed | 1 | |
| <i>Tamarix ramosissima</i> Ledeb. | Perstamarisk / Pink tamarisk | Indringer / Invader | 3 | |
| <i>Tamarix chinensis</i> Lour. | Chinese tamarisk / Chinese tamarisk | Indringer / Invader | 3 | |
| <i>Tecoma stans</i> (L.) H.B.K. | Geelklokkies / Yellow bells | Onkruid / Weed | 1 | |
| <i>Tipuana tipa</i> (Benth.) Kuntze | Tipoeboom / Tipu tree | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Tithonia diversifolia</i> (Hemsl.) A. Gray | Mexikaanse sonneblom / Mexican sunflower | Onkruid / Weed | 1 | |
| <i>Tithonia rotundifolia</i> (Mill.) S.F. Blake | Rooisonneblom / Red sunflower | Onkruid / Weed | 1 | |
| <i>Toona ciliata</i> M.J. Roem. (= <i>Cedrela toona</i> Roxb. ex Rottl. & Willd.) | Toonboom / Toon tree | Indringer / Invader | 3 | Kyk / See subreg. 15.C(7)(c) |
| <i>Ulex europaeus</i> L. | Gaspeldoring / European gorse | Onkruid / Weed | 1 | |
| <i>Xanthium spinosum</i> L. | Boetebos / Spiny cocklebur | Onkruid / Weed | 1 | |
| <i>Xanthium strumarium</i> L. | Kankerroos / Large cocklebur | Onkruid / Weed | 1 | |

Appendix 2: Protected Trees

Extract from Government Notice 877, 22 November 2013:

| Botanical Name | Common English Name |
|---|----------------------------|
| <i>Acacia erioloba</i> | Camel Thorn |
| <i>Acacia haematoxylon</i> | Grey Camel Thorn |
| <i>Adansonia digitata</i> | Baobab |
| <i>Azelia quanzensis</i> | Pod Mahogany |
| <i>Balanites [maughamii]</i> | Torchwood |
| <i>Barringtonia racemosa</i> | Powder-puff Tree |
| <i>Boscia albitrunca</i> | Shepherd's Tree |
| <i>Brachystegia spiciformis</i> | Msasa |
| <i>Breonadia salicina</i> | Matumi |
| <i>Bruguiera gymnorhiza</i> | Black Mangrove |
| <i>Cassipourea swaziensis</i> | Swazi Onionwood |
| <i>Catha edulis</i> | Bushman's Tea |
| <i>Ceriops tagal</i> | Indian Mangrove |
| <i>Cleistanthus schlechteri [schlechteri]</i> | False Tamboti |
| <i>Colubrina nicholsonii</i> | Pondo Weeping Thorn |
| <i>Combretum imberbe</i> | Leadwood |
| <i>Curtisia dentata</i> | Assegai |
| <i>Elaeodendron transvaalensis</i> | Bushveld Saffron |
| <i>Erythrophysa transvaalensis</i> | Bushveld Red Balloon |
| <i>Euclea pseudebenus</i> | Ebony Guarri |
| <i>Ficus trichopoda</i> | Swamp Fig |
| <i>Leucadendron argenteum</i> | Silver Tree |
| <i>Lumnitzera racemosa [racemosa]</i> | Tonga Mangrove |
| <i>Lydenburgia abbottii</i> | Pondo Bushman's Tea |
| <i>Lydenburgia cassinoides</i> | Sekhukhuni Bushman's Tea |
| <i>Mimusops caffra</i> | Coastal Red Milkwood |
| <i>Newtonia hildebrandtii [hildebrandtii]</i> | Lebombo Wattle |
| <i>Ocotea bullata</i> | Stinkwood |
| <i>Ozoroa namaquensis</i> | Gariiep Resin Tree |
| <i>Philenoptera violacea</i> | Apple-leaf |
| <i>Pittosporum viridiflorum</i> | Cheesewood |
| <i>Podocarpus elongatus</i> | Breede River Yellowwood |
| <i>Podocarpus falcatus</i> | Outeniqua Yellowwood |

| Botanical Name | Common English Name |
|-------------------------------------|----------------------------|
| <i>Podocarpus henkelii</i> | Henkel's Yellowwood |
| <i>Podocarpus latifolius</i> | Real Yellowwood |
| <i>Protea comptonii</i> | Saddleback Sugarbush |
| <i>Protea curvata</i> | Serpentine Sugarbush |
| <i>Prunus africana</i> | Red Stinkwood |
| <i>Pterocarpus angolensis</i> | Wild Teak |
| <i>Rhizophora mucronata</i> | Red Mangrove |
| <i>Sclerocarya birrea [caffra]</i> | Marula |
| <i>Securidaca longepedunculata</i> | Violet Tree |
| <i>Sideroxylon inerme [inerme]</i> | White Milkwood |
| <i>Tephrosia pondoensis</i> | Pondo Poison Pea |
| <i>Warburgia salutaris</i> | Pepper-bark Tree |
| <i>Widdringtonia cedarbergensis</i> | Clanwilliam Cedar |
| <i>Widdringtonia schwarzii</i> | Willowmore Cedar |

Appendix 3: Environmental Incident Log and Complaint Form

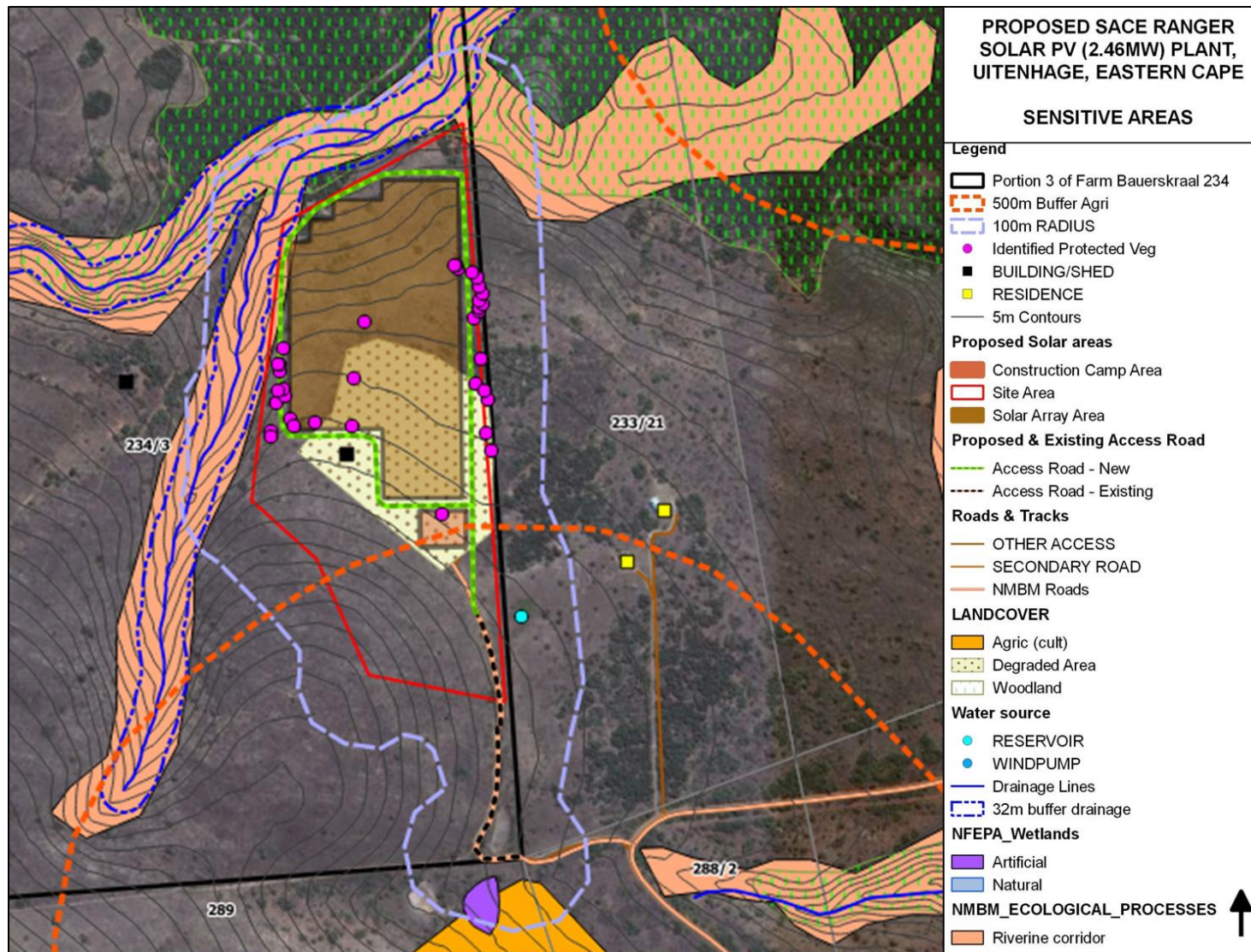
Environmental Log and Incident Report

| Date | Environmental Incident | Notes- Include an explanation if possible for the condition / incident and persons responsible. Include photographic records and other material | Corrective Action Taken | Signature |
|------|------------------------|---|-------------------------|-----------|
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Complaint Form

| | | | |
|---------------------------------|------------------------------|----------------|-------------|
| Complaint Record Sheet | File No Reference | Date | |
| Complaint Lodged By: | | | |
| Capacity of Complainant | | | |
| Complaint Logged by | | | |
| Details of Complaint: | | | |
| | | | |
| Proposed Remedial Action | | | |
| | | | |
| Notes by ECO / Auditor | | | |
| | | | |
| ECO | Date | Auditor | Date |
| Resident Engineer | Date | | |

Appendix 4: Environmental Sensitivity Map



Appendix 5: Eskom requirements for work in or near Eskom servitudes or infrastructure and Renewable Energy Generation Plant Setbacks to Eskom Infrastructure

Eskom requirements for work in or near Eskom servitudes or infrastructure

1. Eskom's rights and services must be acknowledged and respected at all times.
2. Eskom shall at all times retain unobstructed access to and egress from its servitudes.
3. Eskom's consent does not relieve the developer from obtaining the necessary statutory, land owner or municipal approvals.
4. Any cost incurred by Eskom as a result of non-compliance to any relevant environmental legislation will be charged to the developer.
5. If Eskom has to incur any expenditure in order to comply with statutory clearances or other regulations as a result of the developer's activities or because of the presence of his equipment or installation within the servitude restriction area, the developer shall pay such costs to Eskom on demand.
6. The use of explosives of any type within 500 metres of Eskom's services shall only occur with Eskom's previous written permission. If such permission is granted the developer must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard.
7. Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion. The measures taken shall be to Eskom's satisfaction.
8. Eskom shall not be liable for the death of or injury to any person or for the loss of or damage to any property whether as a result of the encroachment or of the use of the servitude area by the developer, his/her agent, contractors, employees, successors in title, and assignees. The developer indemnifies Eskom against loss, claims or damages including claims pertaining to consequential damages by third parties and whether as a result of damage to or interruption of or interference with Eskom's services or apparatus or

otherwise. Eskom will not be held responsible for damage to the developer's equipment.

9. No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the developer must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager

Note: Where and electrical outage is required, at least fourteen work days are required to arrange it.

10. Eskom's rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with.
11. Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.
12. The clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated by *Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993)*.
13. Equipment shall be regarded electrically live and therefore dangerous at all times.
14. In spite of the restrictions stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), as an additional safety precaution, Eskom will not approve the erection of houses, or structures occupied or frequented by human beings, under the power lines or within the servitude restriction area.
15. Eskom may stipulate any additional requirements to highlight any possible exposure to Customers or Public to coming into contact or be exposed to any dangers of Eskom plant.
16. It is required of the developer to familiarise himself with all safety hazards related to Electrical plant.
17. Any third party servitudes encroaching on Eskom servitudes shall be registered against Eskom's title deed at the developer's own cost. If such a servitude is brought into being, its existence should be endorsed on the Eskom servitude deed concerned, while the third party's servitude deed must also include the rights of the affected Eskom servitude.

Renewable Energy Generation Plant Setbacks to Eskom Infrastructure

| | | |
|---|------|------------|
|  Eskom | SCOT | Technology |
|---|------|------------|

Title: **Renewable Energy Generation Plant Setbacks to Eskom Infrastructure** Unique Identifier: **240-65559775**

Alternative Reference Number: **N/A**

Area of Applicability: **Power Line Engineering**



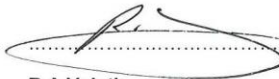
Documentation Type: **Guideline**

Revision: **0**


Total Pages: **8**

Next Review Date: **N/A**

Disclosure Classification: **CONTROLLED DISCLOSURE**

| | | |
|---|--|--|
| <p>Compiled by</p> <p></p> <p>.....</p> <p>J W Chetty Mechanical Engineer Date: <u>20/02/2014</u></p> | <p>Approved by</p> <p></p> <p>.....</p> <p>V Naidoo Chief Engineer (Lines) Date: <u>24/02/2014</u></p> | <p>Authorised by</p> <p></p> <p>.....</p> <p>R A Vajeth Acting Snr Manager (Lines) Date: <u>27/2/2014</u></p> |
|---|--|--|

Supported by SCOT/SC



.....

R Vajeth
SCOT/SC/ Chairperson
Date: 27/2/2014

PCM Reference: 240-65132732 **LINE ENGINEERING SERVICES**
SCOT Study Committee Number/Name : **OVERHEAD LINES**

Wind Turbine Eskom Setbacks Unique Identifier: 240-65559775
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EXECUTIVE SUMMARY

In recent decades, the use of wind turbines, concentrated solar plants and photovoltaic plants have been on the increase as it serves as an abundant source of energy. This document specifies setbacks for wind turbines and the reasons for these setbacks from infrastructure as well as setbacks for concentrated solar plants and photovoltaic plants. Setbacks for wind turbines employed in other countries were compared and a general setback to be used by Eskom was suggested for use with wind turbines and other renewable energy generation plants.

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1. INTRODUCTION

During the last few decades, a large amount of wind turbines have been installed in wind farms to accommodate for the large demand of energy and depleting fossil fuels. Wind is one of the most abundant sources of renewable energy. Wind turbines harness the energy of this renewable resource for integration in electricity networks. The extraction of wind energy is its primary function and thus the aerodynamics of the wind turbine is important. There are many different types of wind turbines which will all exhibit different wind flow characteristics. The most common wind turbine used commercially is the Horizontal Axis Wind Turbine. Wind flow characteristics of this turbine are important to analyse as it may have an effect on surrounding infrastructure.

Wind turbines also cause large turbulence downwind that may affect existing infrastructure. Debris or parts of the turbine blade, in the case of a failure, may be tossed behind the turbine and may lead to damage of infrastructure in the wake path.

This document outlines the minimum distances that need to be introduced between a wind turbine and Eskom infrastructure to ensure that debris and / or turbulence would not negatively impact on the infrastructure.

Safety distances of wind turbines from other structures as implemented by other countries were also considered and the reasons for their selection were noted.

Concentrated solar plants and photovoltaic plants setbacks away from substations were also to be considered to prevent restricting possible power line access routes to the substation.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document provides guidance on the safe distance that a wind turbine should be located from any Eskom power line or substation. The document specifies setback distances for transmission lines (220 kV to 765 kV), distribution lines (6.6 kV to 132 kV) and all Eskom substations. Setbacks for concentrated solar plants and photovoltaic plants are also specified away from substations.

2.1.1 Purpose

Setbacks for wind turbines and power lines / substations are required for various reasons. These include possible catastrophic failure of the turbine blade that may release fragments and which may be thrown onto nearby power lines that may result in damage with associated unplanned outages. Turbulence behind the turbine may affect helicopter flight during routine Eskom live line maintenance and

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inspections that may lead to safety risk of the aircraft / personnel. Concentrated solar plants and photovoltaic plants setback away from substations were required to prevent substations from being boxed in by these renewable generation plants limiting line route access to the substations.

2.1.2 Applicability

This document is applicable to the siting of all new and existing wind turbines, concentrated solar plants and photovoltaic plants near power lines and substations.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

1. <http://www.envir.ce/orb.aw/class=file/action=preview/id=1170403/Hiiiumaa+turbulence+impact+EMD.pdf>.
2. <http://www.energy.ca.gov/2005publications/CEC-500-2005-184/CEC-500-2005-184.PDF>
3. <http://www.adamscountywind.com/Revised%20Site/Windmills/Adams%20County%20Ordinance/Adams%20County%20Wind%20Ord.htm>
4. http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=PA11R&RE=1&EE=1
5. <http://www.wind-watch.org/documents/european-setbacks-minimum-distance-between-wind-turbines-and-habitations/>
6. <http://www.publications.parliament.uk/pa/ld201011/ldbills/017/11017.1-i.html>
7. http://www.caw.ca/assets/pdf/Turbine_Safety_Report.pdf
8. Rogers J, Slegers N, Costello M. (2011) A method for defining wind turbine setback standards. Wind energy 10.1002/we.468

2.2.2 Informative

None

2.3 DEFINITIONS

| Definition | Description |
|------------|---|
| Setback | The minimum distance between a wind turbine and boundary line/dwelling/road/infrastructure/servitude etc. |
| Flicker | Effect caused when rotating wind turbine blades periodically cast shadows |
| Tip Height | The total height of the wind turbine ie. Hub height plus half rotor diameter (see Figure1) |

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2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

| Abbreviation | Description |
|--------------|-------------|
| None | |

2.5 ROLES AND RESPONSIBILITIES

All personnel involved in the positioning wind turbines, concentrated solar plants and photovoltaic plants near power lines/substations must follow the setbacks outlined in this guideline.

2.6 PROCESS FOR MONITORING

Approval by Eskom in writing.

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. DOCUMENT CONTENT

3.1 INTERNATIONAL SETBACK COMPARISON

Wind Turbine setbacks employed by various countries were considered. It was found that setbacks were determined for various reasons that include noise, flicker, turbine blade failure and wind effects. The distances (setbacks) varied based on these factors and were influenced by the type of infrastructure

Wind turbine setbacks varied for roads, power lines, dwellings, buildings and property and it was noted that the largest setbacks were employed for reasons of noise and flicker related issues [1-7]. Very few countries specified setbacks for power lines.

The literature survey [1-7], yielded information about studies and experiments were conducted to determine the distance that a broken fragment from a wind turbine might be thrown. Even though of low probability of hitting a power line [5.0×10^{-5}]^[8], the distances recorded were significant [750m]^[8]

Setbacks were thus introduced to prevent any damage to Eskom infrastructure.

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Wind turbines may also cause changes in wind patterns with turbulent effects behind the hub. These factors dictate the wind turbine setbacks specified in this document.

Concentrated solar plants and photovoltaic plants also can limit access into the substation for power lines of all voltages. A setback distance must therefore be employed to prevent the substation from being boxed in by these generation plants. These setback distances are specified in this document.

3.2 ESKOM REQUIRED SETBACKS

- Eskom requires a setback distance of 3 times the tip height of the wind turbine from the edge of the closest Eskom servitude (including vacant servitudes) for transmission lines.
- Eskom requires a setback distance of 1 times the tip height of the wind turbine from the edge of the closest Eskom servitude (including vacant servitudes) for distribution Lines.
- Eskom must be informed of any proposed wind turbine, concentrated solar plants and photovoltaic activity within a 5 km radius of a substation. No wind turbine structure shall be built within a 2 km radius of the closest point of the substation. Where concentrated solar plants and photovoltaic structures fall within a 2 km radius of the closest point of a substation, Eskom should be informed in writing during the planning phase of the construction of such plant or structure.
- Applicants must show that Eskom radio telecommunication systems (mainly microwave systems) will not be affected in any way by wind turbines.

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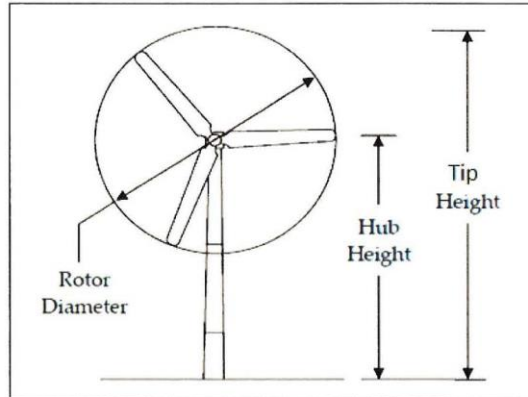


Figure 1: Horizontal Axis Wind Turbine ^[2]

4. AUTHORISATION

This document has been seen and accepted by:

| Name & Surname | Designation |
|------------------|-----------------------------|
| V Naidoo | Chief Engineer |
| Dr P H Pretorius | Electrical Specialist |
| J Geeringh | Snr Consultant Environ Mngt |
| B Haridass | Snr Consultant Engineer |
| R A Vajeth | Acting Snr Manager (Lines) |

5. REVISIONS

| Date | Rev. | Compiler | Remarks |
|---------------|------|------------|---|
| November 2013 | 0 | J W Chetty | First Publication - No renewable energy generation plant setback specification in existence |

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6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

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Dr Pieter H Pretorius (Electrical Specialist)

John Geeringh (Snr Consultant Environ Mngt)

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