# APPENDIX F

## ENVIRONMENTAL MANAGEMENT PROGRAMME

Appendix 1: EAP Curriculum Vitae

Appendix 2: Bird Flight Diverters

Appendix 3: Template for Method Statements

Appendix 4: Example of Environmental Awareness Training

Appendix 5: EMC Control Plan

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# KOKERBOOM 1 WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE ON FARMS RE/227 AND 1163, NEAR LOERIESFONTEIN IN THE NORTHERN CAPE

Proposed Amendment: Environmental Management Programme

**Business Venture Investments No. 1788 (Pty) Ltd**

**April 2019**

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Bringing ideas to life

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Document prepared by:

**Aurecon South Africa (Pty) Ltd**
Reg No 1977/003711/07
Aurecon Centre
1 Century City Drive
Waterford Precinct
Century City
Cape Town 7441
PO Box 494
Cape Town 8000
South Africa

**Ms Franci Gresse**
**T** +27 21 526 9400
**F** +27 21 526 9500
**E** capetown@aurecongroup.com
**W** aurecongroup.com



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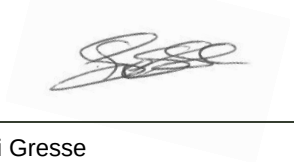
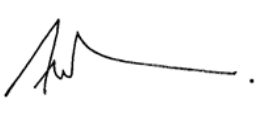
| Reviewer signature |  | Approver signature |  |
| Name | Franci Gresse | Name | Andries van der Merwe |
| Title | Senior Environmental Consultant | Title | Project Director |

**Updating of the Environmental Management Programme**

Minor changes have been made to the Final Environmental Management Programme (EMPr), dated 15 August 2017, to include additional mitigation measures identified by the specialist required for the proposed amendments. Where feasible, some of the conditions of the Environmental Authorisation (EA) were also incorporated, but this will mainly take place during the final design phase as per the requirements of Conditions 17 and 18 of the EA. Additions to the EMPr have been underlined, and removed text is indicated with a ~~strikethrough~~.

The following points provide a summary of the key changes made:

- Grammatical and typographic errors have been corrected.
- Replacing project specifications with the proposed amendment specifications.
- Replacing the sensitivity map with a revised sensitivity map that shows the proposed re-optimised layout.
- Incorporating additional mitigation measures identified by the specialists (as described in the Kokerboom 1 Wind Farm Amendment Report, 2019).

# ABBREVIATIONS

| | |
|---|---|
| **BBBEE** | Broad Based Black Economic Empowerment |
| **BFD** | Bird Flight Diverters |
| **CBA** | Critical Biodiversity Area |
| **DAFF** | Department of Agriculture, Forestry and Fisheries |
| **DEA** | Department of Environmental Affairs |
| **DEA&DP** | Department of Environmental Affairs and Development Planning |
| **DENC** | Northern Cape Department of Environmental Affairs and Nature Conservation |
| **DM** | District Municipality |
| **DWS** | Department of Water and Sanitation |
| **EA** | Environmental Authorisation |
| **EAP** | Environmental Assessment Practitioner |
| **ECO** | Environmental Control Officer |
| **EIA** | Environmental Impact Assessment |
| **EIR** | Environmental Impact Report |
| **EMPr** | Environmental Management Programme |
| **EO** | Environmental Officer |
| **ESA** | Ecological Support Area |
| **GPS** | Geographical Positioning System |
| **LM** | Local Municipality |
| **MTS** | Main Transmission Substation |
| **NDP** | National Development Plan |
| **NEMA** | National Environmental Management Act (Act 107 of 1998) |
| **NEM:BA** | National Environmental Management: Biodiversity Act (Act 10 of 2004) |
| **NEM:WA** | National Environmental Management: Waste Act (Act 59 of 2008) |
| **NFEPA** | National Freshwater Ecosystem Priority Areas |
| **NHRA** | National Heritage Resources Act (Act 25 of 1999) |
| **NPAES** | National Protected Areas Expansion Strategy |
| **NWA** | National Water Act (Act 36 of 1998) |
| **OHSA** | Occupational Health and Safety Act (No. 85 of 1998) |
| **SAHRA** | South African Heritage Resources Authority |
| **SANBI** | South African National Biodiversity Institute |
| **SIBIS** | SANBI Integrated Biodiversity Information System |
| **WEF** | Wind Energy Facility |
| **WULA** | Water Use Licence Application |

## UNITS OF MEASUREMENT

| | |
|---|---|
| **ha** | Hectares |
| **km** | kilometres |
| **Km/h** | Kilometre per hour |
| **kV** | Kilovolt |
| **m** | metres |
| **Mm** | millimetre |
| **MW** | Megawatts |

## DEFINITIONS AND TERMINOLOGY

**Alien species –** (a) a species (plant or animal) that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

**Auditing –** A systematic, documented, periodic and objective evaluation of how well the environmental management programme is performing with the aim of helping to safeguard the environment by facilitating management control of which would include meeting regulatory requirements.

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

**Contaminated water –** Water contaminated by the Contractor's activities such as with hazardous substances, hydrocarbons, paints, solvents and runoff from plant, workshop or personnel wash areas but excludes water containing cement/ concrete or silt.

**Corrective action –** Reactive response required to address an environmental problem that is in conflict with the requirements of the EMPr. The need for corrective action may be determined through monitoring, audits or management review.

**Dust –** Any material composed of particles small enough to pass through a 1 mm screen and large enough to settle by virtue of their weight into the sampling container from the ambient air.

**Environmental Impact Assessment** - is a process that evaluates the environmental and socio-economic characteristics of proposed projects and the consequences of the project on the environment and the people that live in the area affected by the project activities. Where negative impacts are likely to result from the project, measures can be recommended to avoid or lessen these impacts to a level where the impacts are considered environmentally and socially acceptable. Where positive impacts are likely to result from the project, measures can be recommended to increase these impacts. The EIA process also provides interested and affected parties (I&APs) with an opportunity to comment on the project and to be kept informed about decisions that may affect them or the environment.

**Environmental Management Programme –** an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced.

**Erosion** – The loss of soil through the action of water, wind, ice or other agents, including the subsidence of soil.

**Method Statement –** A written submission setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Project manager/Client/ECO

when requesting the Method Statement, in such detail that the Project Manager/Client/ECO is enabled to assess whether the Contractor's proposal is in accordance with the Specifications/EMPr and/or will produce results in accordance with the Specifications/EMPr.

The method statement shall cover applicable details with regard to:

- construction procedures;
- materials and equipment to be used;
- getting the equipment to and from site;
- how the equipment/ material will be moved while on site;
- of any liquid or material that may occur;
- how and where material will be stored, the containment (or action to be taken if containment is not possible) of leaks or spills timing and location of activities;
- compliance/ non compliance with the Specifications; and
- any other information deemed necessary by the Engineer.

**Mitigation –** Measures designed to avoid, reduce or remedy adverse impacts.

**Monitoring –** The repetitive and continued observation, measurement and evaluation of environmental criteria to follow changes over a period of time and to assess the efficiency of control measures.

**Pollution –** Any change in the environment caused by (a) substances, (b) radioactive or other waves; or (c) noise, odours, dust or heat; emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

**Reasonable –** Unless the context indicates otherwise, reasonable in the opinion of the relevant environmental authority.

**Ripping –** The action of loosening of the soil to a depth of 300mm, parallel to the contours and not more than 300mm apart.

**Scarifying –** Loosening the soil in areas which have become hard and compacted and which need to be loosened in order to facilitate revegetation.

**Solid waste –** All non-liquid waste including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

**Subsoil –** The soil horizons between the topsoil horizon and the underlying parent rock.

**Topsoil –** The upper soil profile irrespective of the fertility appearance, structure, agriculture potential, fertility and composition of the soil, usually containing organic material and which is colour specific.

**Waste –** Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of the National Environmental Management: Waste Act (No. 59 of 2008).

**Watercourse –** (a) a river or spring, (b) a natural channel in which water flows regularly or intermittently, (c) a wetland, pan, lake or dam into which, or from which, water flows.

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## Tables

# 1 INTRODUCTION

## 1.1 OVERVIEW

This document represents the life-cycle Environmental Management Programme (EMPr) for a proposed wind energy facility (WEF) (hereinafter referred to as Kokerboom 1 Wind Farm), with a generation capacity of up to 256MW and associated infrastructure on adjacent farms near Loeriesfontein in the Northern Cape. The associated infrastructure proposed comprises an onsite substation, the medium and high voltage cables required to distribute the electricity generated, permanent operations & maintenance (O&M) facilities, access and internal service roads, fencing and gates, and a temporary construction camp and laydown area that will be used during the construction period, as well as other additional ancillary infrastructure. More detail is provided on the project description in Section 2.1.

## 1.2 PURPOSE OF THE EMPr

The EMPr has been included as an appendix to the environmental impact assessment report (EIR) in order to provide a link between the impacts identified in the Environmental Impact Assessment Process (undertaken in terms of the Environmental Impact Assessment (EIA) Regulations GN R982, as amended) and the actual environmental management on the ground during project implementation and operation. Although it is unclear whether decommissioning will happen, appropriate measures provided by the environmental assessment practitioner (EAP) and specialists have been provided. The purpose of this document is to provide for environmental management throughout the various life-cycle stages of the proposed development. The following stages are included:

- Planning and design;
- Pre-construction and construction;
- Operation; and
- Decommissioning.

The EMPr is a working document which the proponent (the holder of the Environmental Authorisation for the project, if granted) and any of their consultants and contractors may refer to during implementation phases of the project and against which their environmental performance may be appraised.

Note that this EMPr should not be seen as a static document and should remain flexible to changes in project planning, although the Department of Environmental Affairs (DEA) should be notified of significant changes or deviations. Such notification should be submitted with a motivation for such deviation and DEA given opportunity to comment and review conditions of the Authorisation. Significant deviations may necessitate an amendment of the Environmental Authorisation which is subject to predefined set of procedures and involves a public participation process.

## 1.3 LEGAL REQUIREMENTS OF THE EMPr

### 1.3.1 National Environmental Management Act, 1998 (Act No. 107 of 1998)

In terms of the EIA Regulations (GN R982 of 4 December 2014, as amended) enacted in terms of the National Environmental Management Act (no. 107 of 1998) (NEMA), the proposed project triggers Activity 11 (i), 12 (ii), 19, 24 (ii), 28 (ii) and 56 (ii) of GN R983, as amended, Activity 1 and 15 of Regulation R984, as amended, and Activity 18(g)(ii)(ii) of GN R985, as amended. As the proposed project triggers listed activities in terms of GN R983, R984 and R985, it is necessary to submit a Scoping Report and EIR for Environmental Authorisation (EA) to the DEA. Section 19 of the EIA Regulations requires that a final EMPr is submitted as part of the EIR.

The contents of the EMPr must meet the requirements outlined in Section 24N (2) and (3) of NEMA and Appendix 4 of the EIA Regulations. The EMPr must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle including an assessment of the effectiveness of

monitoring and management arrangements after implementation. The Department requires that the EMPr be submitted together with the EIR so that it can be considered simultaneously. Table 1 lists the requirements of an EMPr as stipulated by Appendix 4 GN R982, as amended.

**Table 1 | Appendix 4 of EIA Regulation of GN R982 listing requirements of an EMPr**

| NEMA requirements for EMPrs | | aurecon |
|---|---|---|
| **Appendix 4** | **Content as required by NEMA** | **Page** |
| 1(a) | (i) details of the EAP who prepared the EMPr; and | Control Page, Section 1.4, Annexure A |
| | (ii) details of the expertise of that EAP to prepare an EMPr, including a curriculum vitae; | |
| (b) | a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description; | Section 0 and Section2.1 |
| (c) | a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitives of the preferred site, indicating any areas that should be avoided, including buffers; | Section 0 |
| (d) | a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including - | Section 0 and Chapter 3.1 |
| | (i) planning and design; | |
| | (ii) pre-construction activities; | |
| | (iii) construction activities; | |
| | (iv) rehabilitation of the environment after construction and where applicable post closure; | |
| | (v) where relevant, operation activities; | |
| ~~1(e)~~ | ~~a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d)~~ | Chapter 3.1 |
| (f) | a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to - | |
| | (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; | |
| | (ii) comply with any prescribed environmental management standards or practices; | |
| | (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and | |
| | (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable; | |
| (g) | the method of monitoring the implementation of the impact management actions contemplated in paragraph (f); | |
| (h) | the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f) | |
| (i) | an indication of the persons who will be responsible for the implementation of the impact management actions; | |
| (j) | the time periods within which the impact management actions contemplated in paragraph (f) must be implemented; | |
| (k) | the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f); | |
| (l) | a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations; | Section 3.2 |

| Appendix 4 | Content as required by NEMA | Page |
|---|---|---|
| (m) | an environmental awareness plan describing the manner in which - | Section 5.1 |
| | (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and | |
| | (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and | |
| (n) | any specific information that may be required by the competent authority. | N/A |
| (2) | Where a government notice *gazetted* by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply. | N/A |

This document aims to meet the EMPr requirements as legislated by the NEMA Regulations as well as falling in line with the 2013 Department of Environmental Affairs and Development Planning (DEA&DP)[1] guideline document for Environmental Management Programmes/ Plans and the 2004 Integrated Environmental Management Information Series 12 (Environmental Management Plans) written by the DEA (formally the Department of Environmental Affairs and Tourism (DEAT)). This document should thus be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available.

## 1.4 EXPERTISE OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS

Appendix 4 of EIA Regulations and Section 24N (2) and (3) of the NEMA requires that an EMPr must include the details of the person(s) who prepared the EMPr, and the expertise of that person to prepare an EMPr. The *curriculum vitae* of the environmental assessment practitioners (EAPs) who compiled this report are included in Appendix 1.

## 1.5 STRUCTURE OF THE EMPr

The EMPr aims to address environmental management throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning. The EMPr has been structured to include the following sections:

- Chapter 1: Introduction
- Chapter 2: Planning and Design
- Chapter 3: Roles and Responsibilities
- Chapter 4: Environmental Management Plan
- Chapter 5: Plans, Permits and Programmes

[1] This guideline has been used as a best practice tool since it is the most recent guideline on EMPs/EMPrs.

# 2 PLANNING AND DESIGN

This section outlines how environmental considerations have informed and been incorporated into the planning and design phases of the proposed Wind Farm infrastructure. Detailed design is usually undertaken as part of the pre-construction phase as it is a costly undertaking, which is generally undertaken once all required authorisations have been obtained. Thus, the planning and design phases includes those activities associated with the pre-construction phase. Mitigation measures have been recommended for the detailed design phase.

## 2.1 PROJECT DESCRIPTION

Business Venture Investments No. 1788 (Pty) Ltd (BVI) (the Proponent) proposes to construct a WEF and associated infrastructure, with a generation capacity of up to 256MW on two adjacent farms near Loeriesfontein in the Northern Cape. Aurecon South Africa (Pty) Ltd (Aurecon) was appointed to undertake the requisite environmental impact assessment (EIA) process for the proposed Kokerboom 1 Wind Farm, ass required in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) on behalf of the Proponent.

The proposed site of the Kokerboom 1 Wind Farm is located approximately 50 kilometres (km) north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The site can be reached via the unsurfaced Nuwepos Road, which branches off the R357 (see Figure 1 below). Table 2 below provides details of the two affected farm properties.

**Table 2 | Farm details for Kokerboom 1 WEF**

| Name of landowner | Erf number | 21 digit SG code | Name of farm | Farm Size |
|---|---|---|---|---|
| **Kokerboom 1 Wind Farm** | | | | |
| AJ Van Heerden Familie Trust | 1163 | C01500000000116300000 | Leeuwbergrivier | 4,540.72 ha |
| Van der Westhuizen Family | RE/227 | C01500000000022700000 | Kleine Rooiberg | 7,409.95 ha |

The WEF will require a footprint of approximately 154ha during the construction period, after which the site shall be rehabilitated to permanently affect approximately 75ha of land. This infrastructure on the site includes up to 60 wind turbines that will generate up to 6.5MW per turbine with a hub height of up to 150m, and a rotor diameter of up to 180m. The turbines will have a maximum upper tip height of 240m and a minimum lower tip height (ground clearance) of 40m[2]. Adjacent to each turbine, a hardstand area (~50m X 25m) will be constructed to allow for the assembly of the structure by crane. These will be connected to one another with a set of internal service roads. The wind turbines will be connected to one another by medium voltage (33kV) cabling which will generally be buried underground along service road routes where possible, or overhead where they need to traverse undisturbed areas or where technical, geotechnical or topographic constraints or energy losses prohibit the burying of the cables. These medium voltage cables will connect the wind farm to an on-site substation. The on-site substation will collect the electricity generated by the turbines and step-up the energy via a transformer to high-voltage (132kV) which can then be connected to the national grid. From the on-site substation, the electricity will be transferred to a proposed switching station[3] via a high voltage (132kV) overhead transmission line.

The proposed switching station forms part of a separate environmental process, and the impacts and mitigation measures will be discussed in a separate EMPr that focuses on the proposed grid connection infrastructure, connecting the Kokerboom 1 Wind Farm to the national grid.

[2] Note that the hub height and blade length of the final installed turbine may be smaller than the maximum dimensions assessed in the EIA. However, a minimum ground clearance (lower tip height) of 40m will be applied via selection of an appropriate tower and rotor combination. The EIA has considered a range of possible turbine dimensions from a lower tip height of 40m up to a maximum tip height of 240m, with a maximum hub height of 150m and rotor of 180m.

[3] The switching station will be shared between the Kokerboom 1 WEF and the neighbouring Kokerboom 2 WEF, and has been assessed in a separate EIA. The switching station is not included in this EMPr, however the on-site collector substation is included.

During the construction period, an area for a construction camp and temporary laydown area is required, as well as a cement batching/stockpile area if required. Permanent operation and maintenance (O&M) facilities will be developed, which will include offices, ablution facilities, workshop, storage areas and other facilities required for the operation and maintenance of the wind farm. More detail on the proposed Kokerboom 1 Wind Farm is detailed in Section 5 of the EIR.

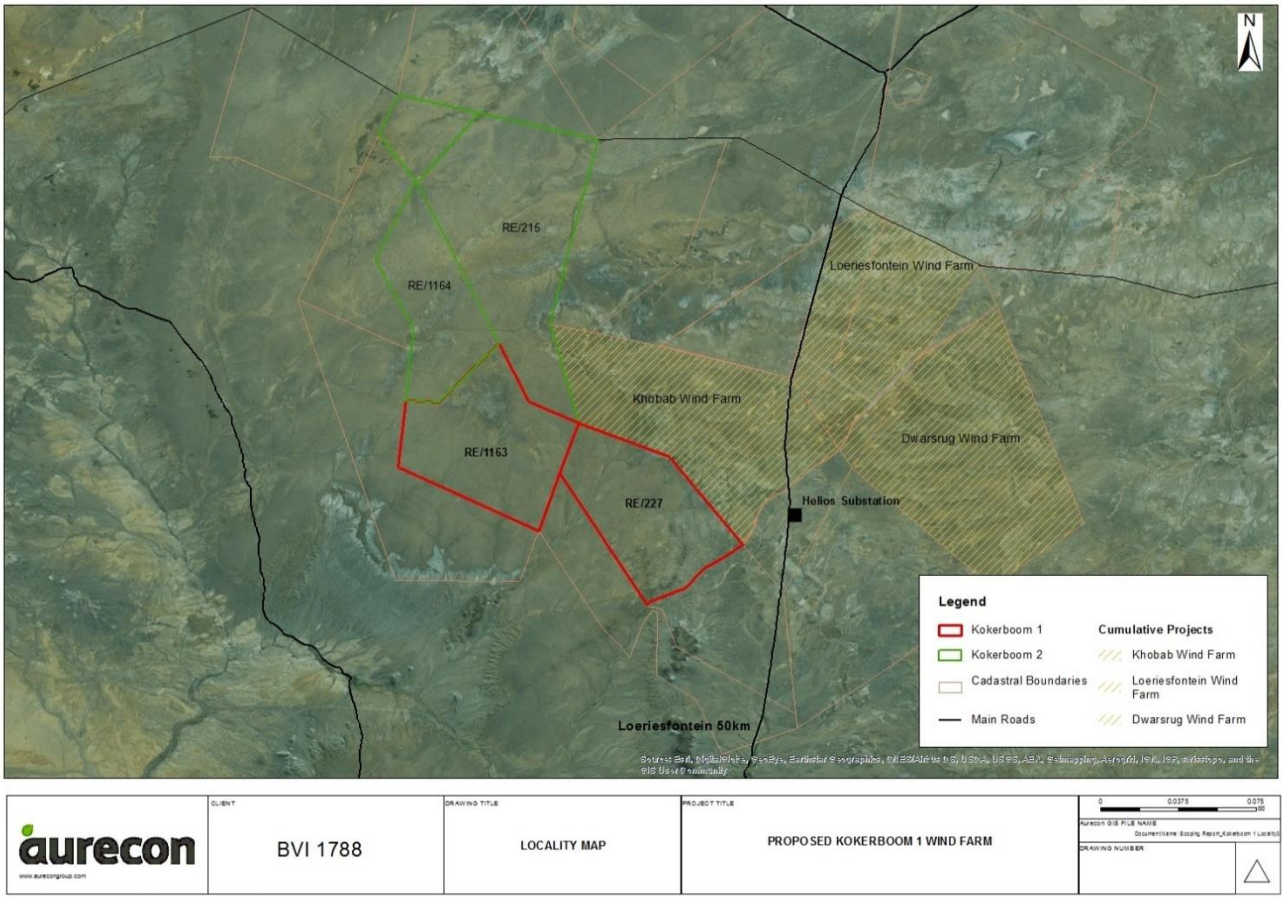


**Figure 1 | Location of the farm portions for the proposed Kokerboom 1 WEF near Loeriesfontein in the Northern Cape**

Table 3 below provides a summary of the activities that are associated with each of the components proposed for the Kokerboom 1 Wind Farm infrastructure. The potential impacts associated with each of these activities have been described and assessed in Section 6 of the EIR. Please note that some activities have been identified in the table below (e.g. site layout finalisation) but have not been included in the impact section of the EIR. This is because no impacts will be caused before the construction phase begins. However, some mitigation measures have been provided for the pre-construction phase, to proactively avoid greater impacts during the construction, operational and decommissioning phases.

Sections 4.1 to 4.4 below provide a set of measures that should be undertaken for each identified activity, in an effort to mitigate against the potential negative impacts caused by the project. Where positive impacts have been identified, measures have been provided to enhance the potential benefits of the project.

**Table 3 | Details of activities associated with Pre-construction, Construction, Operation and Decommissioning phases**

| Main Activity | Components of Activity | Details |
|---|---|---|
| **Pre-Construction** | | |
| Site layout finalisation | Walk-through for micro-siting | The final site layout will be determined within the assessed wind farm footprint during the pre-construction period, with detailed design conducted after all authorisations have been obtained. A walk-through will be required to micro-site the infrastructure and road locations.<br><br>Most of the identified environmental sensitivities on site can be avoided significantly. All effort should be made to ensure that the planning of the project is completed effectively to ensure that no unnecessary environmental degradation occurs, and that there are no delays to the project.<br><br>The relevant landowners must also be consulted during the micro-siting and detailed design process, to ensure that farm infrastructure (such as buried pipelines) are considered. |
| Proactive social measures | Establish grievance mechanism | It is important to ensure that social risk is reduced during the construction period by ensuring that an appropriate grievance mechanism is in place. Furthermore, all of the Contractors' staff must undergo environmental awareness training to ensure they understand the environmental sensitives of the site. |
| | Construction team training | |
| **Construction** | | |
| Site clearance and layout demarcation (all components) | Laying out the construction site and footprint | The construction period for the proposed WEF infrastructure is anticipated to last approximately 18-24 months. During this phase, environmental degradation must be limited to the development footprint. A temporary construction camp will be fenced off and will include a site office, storage areas as well as areas for the management of dangerous and hazardous substances, such as fuel.<br><br>The site layout for the proposed infrastructure will be confirmed on site and the footprint boundaries will be demarcated. No-go areas will also be identified and clearly demarcated.<br><br>Vegetation clearance will occur at the location of the proposed wind turbines and associated infrastructure. Laydown areas will also be required for each wind turbine. As far as possible, this laydown area should occur in areas already transformed (such as roads).<br><br>The start of the construction phase will see a rise in traffic volumes. This will lead to an increase in nuisance impacts such as dust, noise, traffic etc. |
| | Fencing and demarcating site boundaries and no-go areas | |
| | Vegetation clearance | |
| | Increase in traffic (throughout the construction period) | |
| Management of construction camp and behaviour of people | | The temporary construction camp will be an area demarcated for the contractor and his/her employees. This area will include areas for storage of materials, disposal points for waste, shelter, lighting, eating areas, ablution facilities, etc.<br><br>Appropriate management of this area may reduce the potential for behaviour that may harm or degrade the environment (biophysical and social) to be avoided for the duration of this development.<br><br>Certain measures are considered within the construction camp that will influence the behaviour of the workers outside of the construction camp. |

| Main Activity | Components of Activity | Details |
|---|---|---|
| Construction of roads | | Access roads to the site and between the turbines will need to be established. Where possible, existing farm roads must be used and upgraded.<br><br>Some of the roads may need to cross drainage lines where unavoidable. |
| Construction of wind turbines | | At each turbine site, an approximate 32m x 32m area will need to be cleared to allow for the foundation of the turbine to be constructed. This will require a footprint that allows for the turning of large construction vehicles bringing the turbine components to the site. Furthermore, a hardstand area (approximately 50m x 25m) will be required for cranes to be used in the wind turbine assembly process.<br><br>During the detailed design phase, a geotechnical investigation will be required to determine the conditions of the ground for construction. Due to the depth of the foundations required for the wind turbines, blasting may be required during excavation. Blasting is identified to be a specific impact relating to bats (and likely other fauna) and specific measures are therefore considered in Chapter 4. |
| Construction of substations and buildings | | Permanent hard infrastructure will include an on-site substation and an O&M complex (approximately 120m x 120m each).<br><br>The substation facility will cover an area of approximately 14,400m$^2$ (approximately 120m x 120m). The purpose of this substation is to increase ("step-up") the voltage of the electricity from 33kV to 132kV for transmission into the national grid.<br>Suitable fencing will be erected around the substation and O&M facilities, as needed. |
| Construction of transmission lines | Trenches for underground cabling dug out | Each turbine will be connected to the on-site substation via medium voltage cables (~33kV powerlines). Where feasible, these cables will be laid underground in trenches running generally alongside internal roads. Where burying of cables is not possible due to technical, geological, environmental or topographical constraints, then overhead powerlines will be erected.<br><br>High voltage powerlines (~132kV) will be required to transmit the power from the on-site power station to the proposed switching station which forms part of a separate application. |
| | Provision of cabling | |
| | Construction of pylons for overhead transmission lines (33kV and 132kV) | |
| | Assembly of transmission lines | |
| | Connection of transmission lines to on-site substation | |
| Use of water and electricity | | During the construction period (18 - 24 months) the water requirement varies from 5 to 30 kℓ per day. This water will largely be used for the following: road construction; hardstand compaction; concrete foundations; cleaning equipment after concrete pours and dust suppression on roads. |
| Waste management | | Potential waste streams during construction will include general site waste and spoil (some of which can be reused). Bins will be placed at suitable locations within the construction camp and a waste management hierarchy (reduce, reuse recycle) will be required as a condition of the EMPr. Approximately 280,000m$^3$ of spoil will be generated for the Kokerboom 1 Wind Farm, of which approximately 200,000m$^3$ can be reused as part of the construction activities, the |

| Main Activity | Components of Activity | Details |
|---|---|---|
| | | remaining 80,000m$^3$ will be removed from site and delivered to a registered municipal landfill facility. |
| Site rehabilitation | | All disturbed areas that are not intended for permanent use must be rehabilitated at the end of the construction period. This rehabilitation will continue into the operational phase. Specific measures to undertake this rehabilitation must be provided to the Contractor in a revegetation and habitat rehabilitation plan (Section 5.3.5). |
| **Operational** | | |
| Operation, maintenance and monitoring | Generation of electricity | Once operating, the proposed infrastructure has an intended project lifespan of a minimum of 20 years. During this time, the Kokerboom 1 Wind Farm will connect to the national grid via the grid connection infrastructure, transmitting and distributing up to 256MW of electricity.<br><br>The site will remain available to the farmers as rangeland or retained as wilderness area. The construction camp and areas disturbed during the construction phase will be rehabilitated in a phased approach during this time.<br><br>During the operational phase the water requirement would be an estimated 7kℓ per month for 11 months of the year, increasing to approximately 300kℓ per month for one month of the year for annual road maintenance. Water is required during road maintenance for the grading and re-compacting of the roads, which uses approximately 32kℓ/km of road.<br><br>A post construction monitoring programme for birds and bats will also continue into the operational phase. |
| | Operation and maintenance of infrastructure | |
| | Post-construction monitoring of avifauna | |
| | Post-construction monitoring of bats | |
| **Decommissioning** | | |
| Disassembling and rehabilitation | Generation of electricity ceases. | Should the proposed Wind Farm infrastructure no longer be necessary (likely only after 20 years), the infrastructure will be decommissioned. The potential impacts during the decommissioning period (12-18 months) are anticipated to be similar to the construction period.<br><br>After disconnecting the wind farm infrastructure from the electricity network, the wind farm components would be disassembled, removed and reused or recycled as far as possible. All underground cables would be excavated and removed or left *in situ* if appropriate. The buildings and associated infrastructure would be demolished and removed by an authorised company. After disconnecting the transmission line infrastructure, the components would be disassembled, removed and reused or recycled as far as possible. The buildings and associated infrastructure would be demolished and removed by an authorised company.<br><br>The rehabilitation of the disturbed areas would form part of the decommissioning phase. The aim would be to restore the land to its original substratum characteristics (or as near as possible). Appropriate measures should be provided to the Contractor in the revegetation and habitat rehabilitation plan. |
| | Wind turbine components are disassembled and recycled or disposed of. | |
| | Associated Infrastructure (roads, etc.) without further purpose will be deconstructed | |
| | Site rehabilitation. | |

## 2.2 RECEIVING ENVIRONMENT

A summary of the receiving environment as obtained from the specialist reports is presented below. It is important to understand the baseline characteristics of the receiving environment in order to adequately identify the impacts associated with the proposed infrastructure and recommend mitigation measures for all project phases.

### 2.2.1 CLIMATE

The development falls over three climatic units, which are described as cold and arid desert (BWk), hot and arid desert (BWh) and hot and arid steppe (BSk)[4]. Wind in the area is highest in summer, reaching average speeds of 28 to 38 km/hr. The dominant wind direction is from the southwest.

The site area falls within an ecological transitional zone between the Nama Karoo and Succulent Karoo biomes. Rainfall falls mainly in summer in the Nama Karoo, and mainly in the winter in the Succulent Karoo[5]. Rainfall ranges from 100-200 mm and in the summer months falls mostly as thunder storms[6] (refer to Figure 2).

The temperature in the area is characterised by dry hot days in the summer (daily average of 30°C during the day and 16°C at night) and very cold nights in the winter.

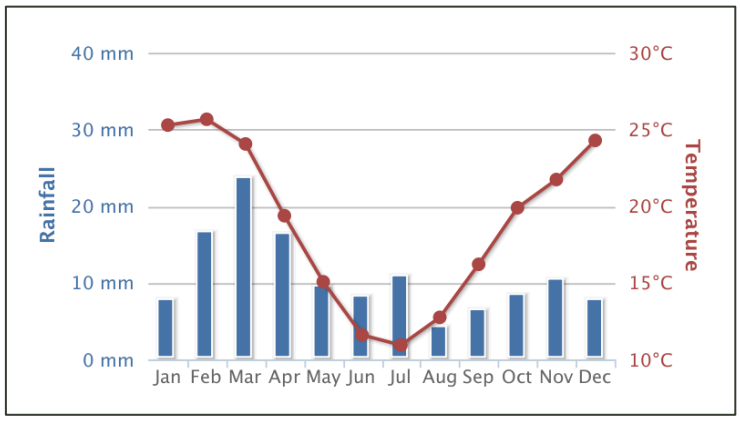


**Figure 2 | Average monthly temperature and rainfall for the site (The World Bank Climate Change Knowledge Portal, undated).**

### 2.2.2 TOPOGRAPHY, GEOLOGY AND SOILS

The portion of Kokerboom 1 Wind Farm falling within the Leeuwbergrivier farm (1163) is located on a generally flat terrain that tends towards the south. A 'koppie' spanning approximately 2.5 km (in a north-south direction) lies at the northern area of the property. This is clearly evident in the aerial imagery of the site (Figure 3). The portion of Kokerboom 1 Wind Farm falling within the Kleine Rooiberg Farm (RE/227) is located on a terrain that is slightly less flat. The slope tends down towards the southeast altitude across the study area for the project, and varies between approximately 900 m and 1000 m above sea-level.

[4] Koppen climate classification. *Encyclopaedia Britannica.* (Online). https://global.britannica.com/science/Koppen-climate-classification [Accessed 14 July 2016].

[5] Van Rooyen, C. 2017. Bird Impact Assessment Report for proposed 132kV Grid Connection for the Kokerboom Wind Energy Facilities, Loeriesfontein, Northern Cape. Report prepared for Aurecon South Africa (Pty) Ltd.

[6] Todd, S. 2017. Basic Assessment for the proposed grid connection from Kokerboom 1, 2 and 3 Wind Farms proposed near Loeriesfontein in the Northern Cape: Fauna and Flora specialist assessment report. Report prepared for Aurecon South Africa (Pty) Ltd.

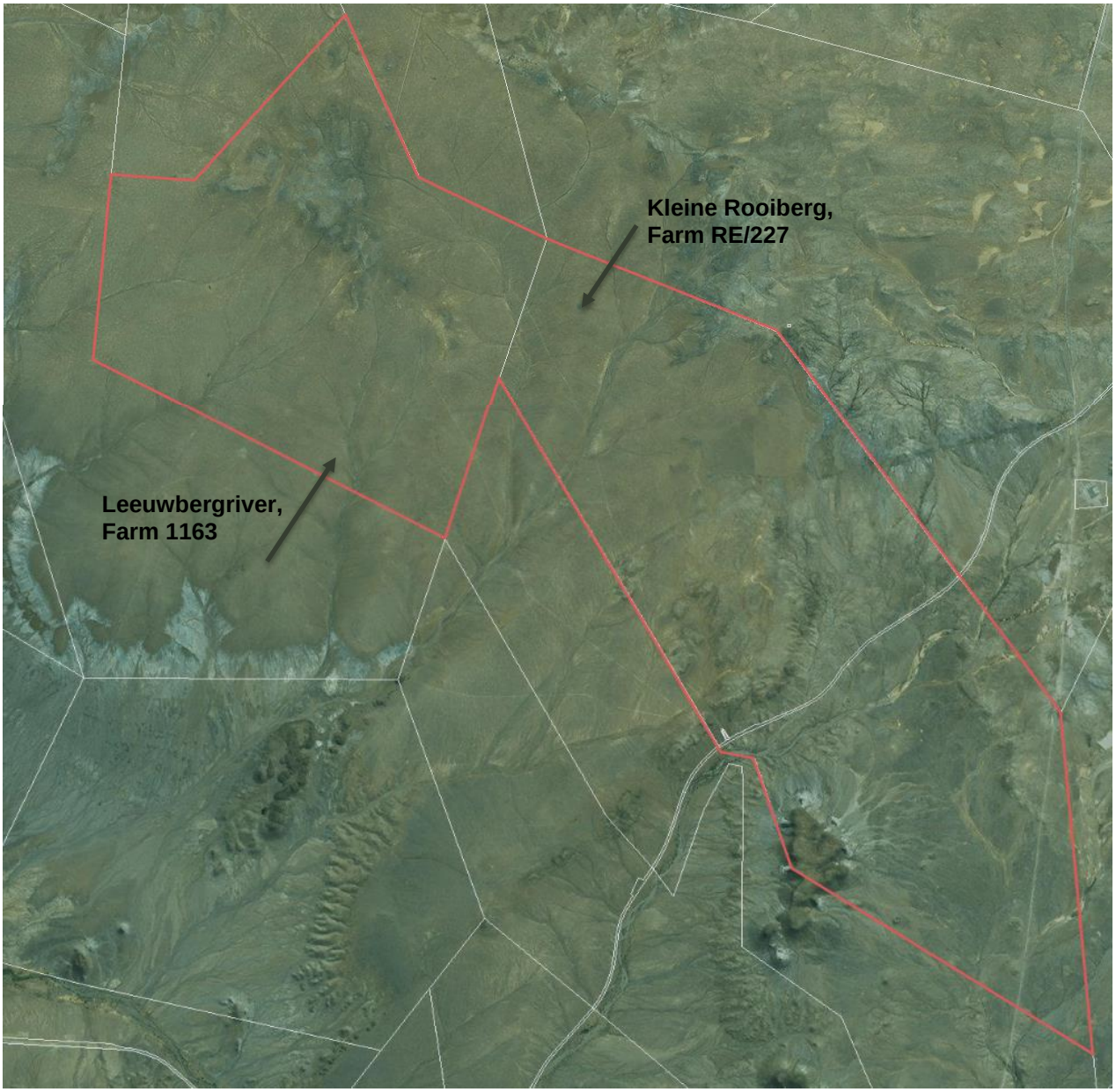


**Figure 3 | Aerial image of the property illustrating the topography**[7]

The underlying geology is shale of the Ecca and Dwyka Groups of the Karoo Supergroup with dolerite intrusions. Soils within the study area are predominantly shallow, sandy soils on underlying rock or hard-pan carbonate. The soils would fall into the Lithic and Calcic soil groups according to the classification of Fey (2010). A field investigation undertaken by an agricultural specialist[8] in June 2016 confirmed the occurrence of shallow, sandy soils on underlying rock or hard-pan carbonate across the entire site (Figure 4). The predominant soil forms are Coega, Mispah, Glenrosa and Askham.

[7] World Imagery from SANBI's BGIS (http://bgisviewer.sanbi.org) [Accessed 7 July 2016].

[8] Lanz, J. 2016. Agricultural and soils impact assessment for the proposed Kokerboom 1 Wind Farm and associated infrastructure as part of the Kokerboom Wind Energy Facility near Loeriesfonteinm, Northern Cape. Report prepared for Aurecon South Africa (Pty) Ltd

**Figure 4 | Typical soil conditions in burrow excavation on site where a shallow hardpan carbonate horizon occurs, with numerous spherical carbonate concretions (Lanz, 2016).**

## 2.2.3 TERRESTRIAL ECOLOGY (excluding bats and birds)

Terrestrial ecology includes land-based plants and animals (not aquatic). Birds and bats have been described in separate sections due to their sensitive nature with regard to wind turbines.

### 2.2.3.1 Flora

The vegetation type covering the study area is mapped as Bushmanland Basin Shrubland[9] which is characterised by small shrubby bushes, succulents, and white grasses. The diversity of the vegetation is considered low, is not protected and is classified as Least Threatened. An ecologist identified that parts of the site are more likely to represent Bushmanland Arid Grassland which is also Least Threatened, and is the second most expansive vegetation type in South Africa.

Areas of higher diversity include exposed calcrete soils which contain specialist species such as *Titanopsis calcarea*, while there are also some low shale-derived hills present which have species such as *Aloinopsis luckhoffii*, *Cephalophyllum fulleri* which is listed as Rare and protected species such as *Aloe falcata*, *Aloe claviflora* and *Hoodia gordonii*.

[9] Mucina, L. and Rutherford ,M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

**Figure 5 | Listed and protected species at the site include *Hoodia gordonii* and *Euphorbia multiceps.***

Due to the habitat diversity that these areas provide compared to the homogenous nature of the rest of the area, they are considered more sensitive than the surrounding plains. Drainage lines on the site are not well developed but are ecologically important as movement corridors and play important hydrological roles during rain events. Disturbance of these areas should be minimised as far as possible.

**Figure 6 | Gravel hills and slopes are considered more sensitive**

**Figure 7 | Drainage lines on the Kokerboom 1 site are important ecological corridors and contain species such as *Stipagrostis namaquensis, Melianthus comosus* and *Lycium* bushes.**

According to the SANBI Integrated Biodiversity Information System (SIBIS) database, a total of 135 indigenous species are known from the area, of which 89 have been observed by the consultant on the site and an additional 28 species were observed that have not been recorded from the area before[10].

There are no critical biodiversity areas (CBAs) within the site boundary, however the access road traverses the CBA to the east of the proposed area. An Ecological Support Area (ESA)[11] runs through the centre of the wind farm site. These areas were mapped according to buffers created around the mapped dry drainage lines, which are categorised as national freshwater ecosystem priority areas (NFEPAs) (refer to Section 2.2.5). The site does not lie within a National Protected Area Expansion Strategy (NPAES) focus area, and has not been

[10] Todd, S. 2017. Environmental Impact Assessment for the Proposed Kokerboom 1 Wind Farm near Loeriesfontein: Fauna and Flora Specialist Impact Assessment Report. Report prepared for Aurecon South Africa (Pty) Ltd.

[11] Oosthuysen, E. and Holness, S. 2016.Northern Cape Critical Biodiversity Areas (CBA) Map. http://cirrus.nmmu.ac.za Northern Cape Department of Environment and Nature Conservation and Nelson Mandela Metropolitan University.

identified as an important area for future conservation area expansion. There are no protected areas in close proximity to the site.

#### 2.2.3.2 Fauna

Mammal, reptile and amphibian diversity in the area is also considered to be low. Listed mammal species which may occur at the site includes the Black-footed cat *Felis nigripes* (Vulnerable) and Honey Badger *Mellivora capensis* which is listed as Endangered in the South African Red Data Book of Mammals, but is listed as Least Concern by the IUCN. There are no listed reptile species which are likely to occur at the site.

**Figure 8 | Black-footed cat *(Felis nigripes)***

**Figure 9 | Honey Badger *(Mellivora capensis)***

Given the aridity of the site and lack of surface water in the area, only six frog species may occur in the area. Amphibian density and diversity is low.

### 2.2.4 BIRDS

Twelve months of pre-construction bird monitoring commenced in November 2015. The proposed development area supports a relatively low diversity and abundance of avifauna, which is to be expected in an arid area like Bushmanland[12].

The abundance of priority species at the proposed development areas is low to moderate. Red Lark and Karoo Korhaan consistently emerged as the two most abundant priority species. Red Lark, Karoo Korhaan and Northern Black Korhaan breed in the development areas, and Ludwig's Bustard, Burchell's Courser and Double-banded Courser potentially too, although no evidence of bustard display areas or nests were recorded. Raptors were generally sparse.

No clear distribution patterns emerged from the sightings data for priority species with Red Lark, Karoo Korhaan and Northern Black Korhaan sightings more or less randomly distributed along all the transects. The rest of the priority species were generally recorded in low numbers with no clear indications of bird/habitat associations, with random sightings scattered all over the greater study area. This is to be expected given the uniformity of the habitat.

In general, very little flight activity of priority species was recorded during the vantage point watches, with an overall passage rate for priority species over the proposed development areas (all flight heights) of 0.3 birds/hour. The risk of collision mortality through collisions with the wind turbines and/or overhead powerlines is likely to affect the bigger priority species, such as Ludwig's Bustard, Jackal Buzzard, Red Lark and Martial Eagle (Figures 10 – 13).

[12] Van Rooyen, C. 2017. Bird Impact Assessment Report for proposed Kokerboom Wind Energy Facility, Loeriesfontein, Northern Cape. Report prepared for Aurecon South Africa (Pty) Ltd.

**Figure 10 | Ludwig's Bustard**

**Figure 11 | Jackal Buzzard**

**Figure 12 | Red Lark**

**Figure 13 | Martial Eagle**

## 2.2.5 BATS

Four bat species were detected during a 12-month pre-construction monitoring period undertaken for the proposed Kokerboom WEFs from October 2015 to October 2016. These include *Eptesicus hottentotus* (Long-tailed serotine), *Miniopterus natalensis* (Natal long-fingered bat), *Neoromicia capensis* (Cape serotine) *and Tadarida aegyptiaca* (Egyptian free-tailed bat).

*Tadarida aegyptiaca*, *Neoromicia capensis*, and *Miniopterus natalensis* (Figure 14) were most commonly detected across the study area. The first two abundant species are of high value to the local ecosystems as they provide a greater contribution to most ecological services than the rarer species due to their high numbers. *Myotis tricolor* and *Eptesicus hottentotus* were detected on site in relatively low abundances and at sporadic intervals.


**Figure 14 | The three most common bats found on site: A) *Tadarida aeyptiaca*, B) *Neoromicia capensis*, and C) *Miniopterus natalensis***

*Minopterus natalensis* is a migratory species and was detected by most monitoring systems. The relative abundance of this species was highest, however there was no detection of a migratory event by any one of the monitoring systems which suggests that the site does not fall within a migratory route of this species. The bat specialist assessment identified a small peak in activity of *M. natalensis* on and near the site over the months of October – December and recommended that the design of the operational monitoring programme consider the possibility of a migratory event.

General bat activity was found to be dependent on several factors including climatic variability, height, and time of night. It was also evident that the different monitoring systems picked up on different activity, suggesting that there are both spatial and temporal differences for peak activity.

**Table 4 | The periods and weather conditions during which peak bat activity was recorded**

| | |
|---|---|
| **Peak Activity Period 1** | Time period: 20 August – 10 October from the time of sunset to 02:00<br><br>Environmental Conditions: Wind speed below 6m/s; AND Temperature above 17°C |
| **Peak Activity Period 2** | Time period: 1 March – 15 May from the time of sunset to 23:00<br><br>Environmental Conditions: Wind speed below 6m/s; AND Temperature above 16°C |

### 2.2.6 AQUATIC ECOLOGY

The proposed development occurs within the E31C Quaternary catchment, within the Nama Karoo ecoregion, while located in the Berg / Oliphant's Water Management Area (WMA9). These catchments are characterised by small/ narrow perennial watercourses and drainage lines. The E31C watercourses are connected to five mainstem systems, namely: Groot/ Hartebeeslaagte, Krom, Leeuberg, Krom and Klein/ Rooiberg.

It was identified, by an aquatic ecologist, that a number of distinct natural channels that convey surface water run-off or have mobile alluvial characteristics due to the concentrated surface water runoff are present on site. These drainage lines were mapped and given a 32m buffer. The proposed infrastructure should avoid these watercourses as far as possible, however some road and cable crossings are unavoidable. Any crossing of the drainage lines will require authorisation from the Department of Water and Sanitation in terms of Section 21(c) and (i) of the National Water Act (Act 36 of 1998) (NWA).

### 2.2.7 HERITAGE, ARCHAEOLOGY AND PALAEONTOLOGY

Heritage resources include archaeological material (e.g. rock paintings, stone tools), paleontological material (e.g. fossilised materials) and cultural heritage material (e.g. old graveyards, fences, ruins of buildings, or sense of place).

Heritage resources were found to be scarce in the study area. Most common were archaeological (Stone Age) sites with these being mostly on the summits of the low hills in the east and around low rock outcrops in the southwest. The landscape is also considered to be a heritage resource but its cultural component is of relatively low significance and has already been compromised by the other wind energy facilities presently under construction.

Palaeontology was considered as a potential sensitive aspect, although upon investigation the site area was found to have low palaeontological sensitivity. Measures have been included below to reduce any possible negative impact caused through construction, however no isolated no-go areas were identified.

### 2.2.8 SOCIO-ECONOMIC ASPECTS

The socio-economic context in which the Kokerboom 1 Wind Farm infrastructure is proposed is typical of small towns in the Northern Cape. Although the Hantam Local Municipality (LM) covers an area of approximately

30,000km$^2$ with plenty of rural agricultural land, 70% of the population live and work in the towns: Brandvlei, Loeriesfontein, Middelpos and Nieuwoudtville.

Unemployment rates (11.7%) are considerably better than the national average (26.5%), but average incomes in the municipal area are generally very low. Up to 60% of the population live below or near to the poverty breadline of R3,200 per month for an average sized household.

The alleviation of poverty is therefore one of the key challenges for economic development in the area. Investment in people is also, to a large extent, about delivering social and economic infrastructure for education, welfare, health, housing, as well as transport and bulk infrastructure. However, one of the key challenges to this is the low education level in both the local and district municipalities.

The level of education is a critical factor that influences the economic and human development of any area. The population of Hantam LM has a low level of education with only 0.7% of the population having some form of higher (tertiary) education. Of the entire population, 4.1% have no schooling, whilst 14.4% of the population older than 20 years have no formal schooling.

Within the study area, agriculture and small-scale salt mining are traditionally the key economic activities. The key (and essentially only) agricultural resource is grazing, almost exclusively by sheep. Whilst much of the veld is palatable, the biomass production is very low, requiring approximately 7-8ha per sheep. This requires farm units to be approximately 10,000ha to be economical. During the interviews with landowners that were conducted by the social specialist Mr Tony Barbour, it was identified that Klein Rooiberg (RE/227), is one of the few farms in the area to be used year round for grazing. Despite this, the operation currently employs no workers, with the only additional employment being seasonal sheep-shearers. Furthermore, the agricultural potential of the land was considered low, and therefore not a limitation to the proposed development.

### 2.2.9 VISUAL

The landscape is predominantly flat and the Wind Farm infrastructure is therefore likely to be visible over some distance. The approximate viewshed of the proposed Wind Farm is widespread in coverage, extending in most directions to the outer 28km limit of the generated viewshed. There is however a precedent for wind farming in the area which increases the visual absorption capacity as well as a low population of potentially sensitive receptors.

## 2.3 SUMMARY OF SPECIFIC IMPACTS IDENTIFIED

The associated EIR for this EMPr assessed a range of potential impacts (negative and positive) that may occur as a result of the construction and operation of the proposed Wind Farm infrastructure. These are listed according to activity and project phase in Table 5. These potential impacts were assessed by the EAP and relevant specialists, and were assigned with an anticipated impact rating (significance). Many of the potential impacts can be mitigated (negative impacts) or enhanced (positive impacts) and therefore this impact rating indicates the significance before and after the mitigation/enhancement measures are implemented. The proposed measures are listed per impact in the EIR and specialist reports (Annexure D to the EIR) and are provided more holistically in the EMPr in Sections 4.1 to 4.4 below.

The impacts below speak both to the individual impacts caused by the proposed Kokerboom 1 Wind Farm infrastructure, as well as cumulatively with consideration of other renewable energy developments falling within a 30km radius of the Kokerboom WEF.

**Table 5 | Summary of identified impacts for the proposed Kokerboom 1 Wind Farm infrastructure**

| Activity | Impact | Significance | |
|---|---|---|---|
| | | Pre-mitigation | Post-mitigation |
| **Pre-construction Phase** | | | |
| No impacts are anticipated to occur with the pre-construction activities. It is important however that the implementation of mitigation measures indicated in Section 4.1 begin in the pre-construction phase, as many of the impacts associated with the construction of the proposed Wind Farm infrastructure can be avoided. | | | |

| Activity | Impact | Significance | |
|---|---|---|---|
| | | Pre-mitigation | Post-mitigation |
| **Construction Phase** | | | |
| Site clearance for construction works (all components) | Loss of vegetation cover and listed or protected species | Medium (-) | Low (-) |
| | Disturbance or harm to fauna | Low (-) | Low (-) |
| | Increased erosion risk | Low (-) | Low (-) |
| | Destruction of bat roosts | Medium (-) | Low (-) |
| | Loss of foraging habitat for bats | Low (-) | Very Low (-) |
| | Displacement of avifauna due to construction related disturbance | Low (-) | Low (-) |
| | Displacement of priority species due to habitat loss | Medium (-) | Medium (-) |
| | Loss of riparian systems and disturbance to alluvial watercourses | Medium (-) | Low (-) |
| | Increase in sedimentation and erosion | Medium (-) | Low (-) |
| | Damage or destruction of archaeological resources | Low (-) | Very Low (-) |
| | Increased risk of grass fires | Medium (-) | Low (-) |
| | Loss of grazing resources (social) | Medium (-) | Low (-) |
| | Cumulative impact of loss of avifaunal habitat due to human induced change (including renewable energy) | *Impacts differ based on bird species*. | |
| Movement of people (construction) | Pollution of localised surface water quality with general and hazardous waste material | Medium (-) | Low (-) |
| | Creation of employment and business opportunities | Low (+) | Medium (+) |
| | Harm to social networks associated with presence of external construction workers | Medium (-) | Low (-) |
| | Harm to social networks associated with the influx of job seekers | Low (-) | Low (-) |
| | Risk to safety of farmers and farm workers, livestock and damage to farm infrastructure | Low (-) | Low (-) |
| | Increase in dust | Low (-) | Low (-) |
| | Increase in sound levels at the dwellings of receptors | Very Low (-) | Very Low (-) |
| | Generation of litter and general waste pollution | Low (-) | Very Low (-) |
| | Increase in traffic to the area (local) | Very Low (-) | Very Low (-) |
| | Increase in traffic to the area (regional) | Low (-) | Very Low (-) |
| | Cumulative impact on local economy | Medium (+) | High (+) |
| | Cumulative pressure on local services | Medium (-) | Low (-) |
| | Presence of large construction vehicles (including cranes) | Medium (-) | Low (-) |
| Rehabilitation of construction phase | Increased risk of sedimentation and soil erosion | Medium (-) | Low (-) |
| | Visual obstruction of landscape to sensitive receptors | High (-) | Medium (-) |
| **Operational Phase** | | | |
| Maintenance activities | Disturbance or harm to fauna | Medium (-) | Low (-) |
| Generation of electricity (all components) | Increased risk of erosion | Medium (-) | Low (-) |
| | Alien plant invasion | Medium (-) | Low (-) |
| | Bat mortalities caused by attraction to turbines from artificial lighting | Medium (-) | Low (-) |
| | Increase in bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration) | High (-) | Medium (-) |

| Activity | Impact | Significance | |
|---|---|---|---|
| | | Pre-mitigation | Post-mitigation |
| | Mortality of priority bird species due to collisions with the turbines | Medium (-) | Low (-) |
| | Change to downstream riparian form and function caused by impacts on drainage patterns | Medium (-) | Low (-) |
| | Increase in sedimentation and erosion | Medium (-) | Low (-) |
| | Creation of employment and business opportunities | Low (+) | Medium (+) |
| | Generate income for affected landowners | Low (+) | Medium (+) |
| | Establishment of a community trust | Low (+) | High (+) |
| | Potential impact on property values | Low (-) | Low (-) |
| | Potential impact on tourism | Neutral | Neutral |
| | Increase of noise | Very Low (-) | N/A |
| | Increase in traffic to the area (local) | Low (-) | Very Low (-) |
| | Increase in traffic to the area (regional) | Very Low (-) | Very Low (-) |
| | Presence of large construction vehicles (including cranes) | Medium (-) | Low (-) |
| | Visual impact: Aircraft warning lights at night time | High (-) | Medium (-) |
| | Visual impact: Presence of wind turbine on landscape | High (-) | Medium (-) |
| | Electromagnetic and radiofrequency interference on SKA infrastructure | Medium-High (-) | Low (-) |
| | Cumulative effect of bat mortalities due to direct blade impact or barotrauma during foraging (resident and migrating bats affected) | High (-) | Medium (-) |
| | Cumulative loss of sense of place | Medium (-) | Medium (-) |
| | Cumulative impact on local services | Medium (-) | Low (-) |
| | Cumulative impacts on local economy | Medium (+) | High (+) |
| Distribution of electricity (internal transmission line) | Mortality of priority bird species due to electrocution on the internal overhead medium voltage powerlines | High (-) | Low (-) |
| | Mortality of priority bird species due to collision with internal medium and high voltage powerlines | High (-) | Low (-) |
| | Promotion of clean, renewable energy | Low (+) | Medium (+) |
| **Decommissioning Phase** | | | |
| Disassembly of wind turbines and associated infrastructure | Disturbance or harm to fauna | Medium (-) | Low (-) |
| | Risk of soil erosion | Medium (-) | Low (-) |
| | Alien plant invasion | Medium (-) | Low (-) |
| | Loss of foraging and habitat for bat species | | |
| | Displacement of priority bird species due to disturbance | Low (-) | Very Low (-) |
| | Pollution of localised surface water quality and general and hazardous waste materials | Medium (-) | Low (-) |
| | Loss of riparian systems and disturbance to alluvial watercourses | Medium (-) | Low (-) |
| | Change to downstream riparian form and function caused by impacts on drainage alterations | Medium (-) | Low (-) |
| | Increase in sedimentation and erosion | Medium (-) | Low (-) |
| | Creation of employment and business opportunities | Low (+) | Medium (+) |
| | Harm to social networks associated with the presence of external construction workers | Medium (-) | Low (-) |

| Activity | Impact | Significance | |
|---|---|---|---|
| | | Pre-mitigation | Post-mitigation |
| | Harm to social networks associated with the influx of job seekers | Low (-) | Low (-) |
| | Risk to safety of farmers and farm workers, livestock and damage to farm infrastructure | Low (-) | Low (-) |
| | Increased risk of grass fires | Medium (-) | Low (-) |
| | Long term benefits associated with the Community Trust | Low (+) | High (+) |
| | Loss of jobs and associated income due to decommissioning | Medium (-) | Very Low (-) |
| | Increase of noise | Very Low (-) | N/A |
| | Increase in traffic to the area (local) | Low (-) | Very Low (-) |
| | Increase in traffic to the area (regional) | Very Low (-) | Very Low (-) |
| | Presence of large construction vehicles (including cranes) | Medium (-) | Low (-) |
| | Visual impact: Aircraft warning lights at night time | High (-) | Medium (-) |

An illustration of the environmental sensitivities and no-go areas is provided in Figure 15 below.

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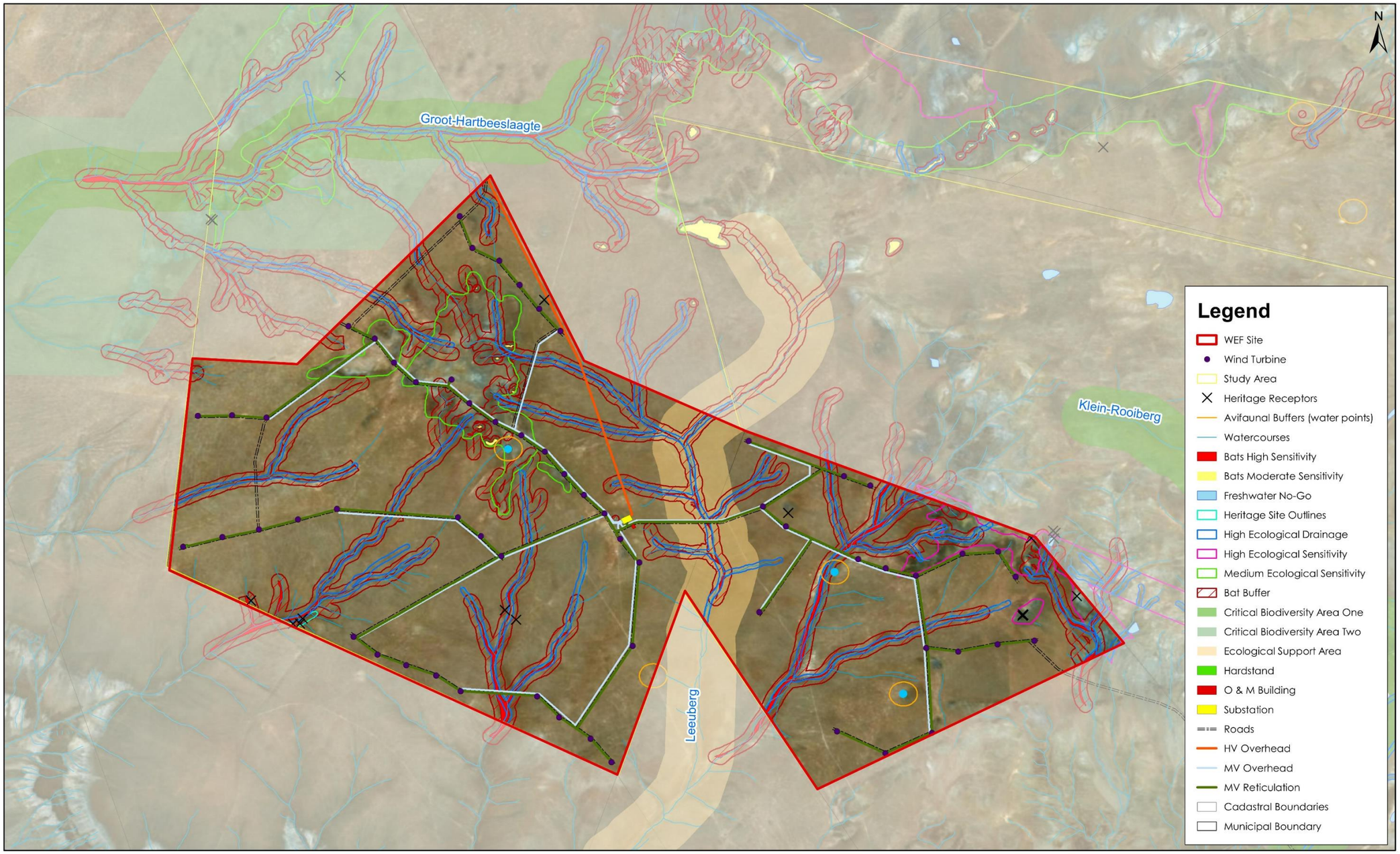


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| aurecon<br>www.aurecongroup.com | CLIENT<br>BVI 1788 | DRAWING TITLE<br>**ENVIRONMENTAL SENSITIVITIES** | PROJECT TITLE<br>**PROPOSED AMENDMENTS: KOKERBOOM 1 WIND FARM** | Aurecon GIS FILE NAME<br>Document Name: EIR_environmental sensitivities_Kokerboom_1WindFarm_v3<br>DRAWING NUMBER |

**Figure 15 | Map of environmental sensitivities and no-go areas**

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# 3 ROLES AND RESPONSIBILITIES

## 3.1 ROLEPLAYERS

### 3.1.1 Proponent

As the holder of the Environmental Authorisation (if granted), the Proponent (or its successor in title) will take overall responsibility for the wind farm and its associated infrastructure. The organisation may change between project phases; however, the responsibilities must be transferred to ensure that the environment is appropriately managed.

The Proponent shall:

- Assume overall responsibility for the administration and implementation of the EMPr through an identified Project Manager or Engineer;
- Appoint or engage a suitably qualified Project Manager or Engineer; and
- Appoint or engage a suitably qualified independent Environmental Control Officer (ECO) for the construction period to:
    - monitor compliance with the EMPr;
    - undertake monthly, and close out, audits of compliance with the requirements of the EMPr; and
    - provide a copy of the audit reports to DEA, the Proponent, and the Contractor.

### 3.1.2 Project Manager

The Project Manager or Site Engineer shall:

- Have overall responsibility for the requisite environmental management activities on site;
- Have the authority to stop works and issue fines, as necessary;
- Receive reports from the ECO and shall report to the Proponent; and
- Support the ECO in his/her roles and responsibilities.

### 3.1.3 Contractor and Environmental Officer (EO)

The Contractor must ensure that all of its sub-contractors, employees, etc., are made fully aware of the environmental issues detailed in this EMPr. The Contractor shall liaise closely with the Site Engineer, Environmental Officer (EO) and the ECO and must ensure that the works on site are conducted in an environmentally responsible manner and in compliance with the requirements of the EMPr, at all times. The Contractor shall appoint a suitably senior member of staff or qualified professional to the position of EO.

The EO's duties during the construction phase will include the following:

- Liaise with all parties on matters relating to the environment;
- Assist with the compilation of environmental components of method statements;
- Undertake daily site compliance inspections of the various work areas;
- Compile a weekly report detailing the key findings and environmental matters observed and dealt with during the week and submit this to the ECO and Engineer;
- Ensure Contractor is implementing the EMPr and conditions of Authorisation;
- Ensure that any environmental monitoring requirements are being fulfilled and include results in the weekly submissions;
- Report environmental accidents and incidents and oversee all remediated works;
- Make recommendations for disciplinary actions where and if required; and
- Undertake environmental awareness training and routine toolbox talks with contractor staff on matters relating to environmental management.

### 3.1.4 Environmental Control Officer (ECO)

The role of the ECO will be to oversee and monitor compliance with and implementation of the construction phase EMPr, which includes compliance with the relevant conditions contained in the EA. This includes the following activities:

- Liaison with the Client, Project Manager or Engineer, EO and DEA;
- Monitoring of all the Contractor's activities for compliance with the various environmental requirements contained in the construction specification;
- Monitoring of compliance with the EA related to the construction phase as issued by DEA as well as other relevant environmental legislation;
- Reviewing of the Contractor's environmental Method Statements;
- Ensuring that the requisite remedial action is implemented in the event of non-compliance;
- Ensuring the proactive and effective implementation and management of environmental protection measures;
- Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately reported and addressed;
- Routine recording and reporting of environmental activities on a weekly and/or monthly basis; and
- Recording and reporting of environmental incidents.

### 3.1.5 Operator

The operator of the wind farm is responsible for overseeing all Operations & Maintenance (O&M) activities associated with the operational wind farm. The operator must appoint or engage a suitably qualified and experienced Environmental Manager (Environmental Officer) or similar qualified person who will be responsible for overseeing the implementation of environmental management activities at the operational wind farm. The duties of the Environmental Manager during the operational phase include:

- Liaison with the Client and DEA;
- Monitoring of the operation of the project for compliance with the various environmental requirements contained in the EMPr;
- Ensuring the proactive and effective implementation and management of environmental protection measures; and
- Monitoring of compliance with the EA related to the operational phase as issued by DEA as well as other relevant environmental legislation.

## 3.2 COMPLIANCE MONITORING

Environmental management is legally required by the National Environmental Management Act (Act 107 of 1998) (NEMA). Environmental management is concerned not only with the final results of the Contractor's operations to carry out the works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the works.

### 3.2.1 Compliance

Successful compliance will see the project being undertaken in an environmentally responsible manner. The lowest opportunity cost of the development will occur as the minimum footprint will be disturbed. The degradation necessary will be appropriately rehabilitated, limiting the negative impacts on the environment to a short-term duration. This will be realised if the mitigation measures in this document are followed.

### 3.2.2 Non-Compliance

Non-compliance may occur for several reasons. This may be due to an accident or single incident, in which case-specific corrective measures may provide an effective solution. However, it may occur due to negligence

which is unacceptable, and could result in a penalty fine. Penalties will be issued for certain transgressions and detailed in the Tender Document. Penalties may be issued per incident at the discretion of the Project Manager. Such penalties will be issued in addition to any remedial costs incurred as a result of non-compliance with this EMPr. The Project Manager will inform the Contractor of the contravention and the amount of the penalty and shall be entitled to deduct the amount from monies due under the Contract, in accordance with the terms of the Contract.

Should there be any incident on site that affects the environment, the following lines of communication are to be implemented.

- All incidents are to be reported immediately to the EO and ECO (during the construction phase) or to the Employer (during the operational phase).
- Depending on the severity of the incident, the EO/ECO/ Employer must make the appropriate contact to notify the relevant authorities and emergency services (if required).
- All construction incidents reported must be included in the ECOs reports.
- Any incident or issue of non-compliance during construction is to be reported by the ECO in a format that is to include the following aspects:
    - Description of the incident/ non-compliance;
    - Remedial action required, including the deadline for such action;
    - Relevant/ supporting documentation (i.e. providing evidence of the non-compliance/ issues not complied with);
    - Relevant diagrams to support the description of the non-compliance and/ or the remedial action to be taken;
    - Provision for dates and signatures of both the ECO and Risk Manager at issuing of the report, as well as completion and verification of the remedial action, as specified in the report.

In some cases, a minor incident may be able to be managed at a low level, but in others they may be required to be escalated. The list below, details the requirements for escalation.

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| Level 1 – General labourer escalate to foreman | Repetitive low risk activities – execution of site specific, everyday tasks, low if any capital cost, maintenance, can be managed by means of specifications or method statements. |
| Level 2 – Foreman escalate to Site Agent | Regular site-specific activities with a degree of capital cost, mostly maintenance. |
| Level 3 – EO/HSE/Site Agent to ECO: | Once-off issues, requires ECO approval. Examples of typical issues include:<br>• Approved construction footprint needs to be widened.<br>• Moderate hydrocarbon or concrete spill requiring notable excavation and volume of hazardous material to be disposed of.<br>• Additional access road required.<br>• Flooding of works.<br>• Serious landowner complaints.<br>• Plant operator/driver got stuck and created new access beyond footprint.<br>• Planned application of herbicide or insecticide.<br>• Position of structure needs to move slightly due to change in site conditions or unexpected founding conditions e.g. weathered rock, deep soils.<br>• Repeated non-conformance/ neglect by contractor. |
| Level 4 - ECO to Competent Authority: | Mostly legal and administrative, systems and objective driven approach. Examples include:<br>• Significant change in scope of work.<br>• Major non-conformance due to neglect or recklessness. |

- Notable deviation from EMPr specifications or objectives to accommodate change in site conditions, financial/ contractual issues, change in project urgency/ deadline.

Activities that are directly endangering the environment or are resulting in a significant and detrimental breach of any environmental authorisation or EMPr condition may be stopped by the Project Manager in consultation with the ECO until such breach is rectified. Regulatory authorities such as the DEA & Northern Cape Department of Environmental Affairs and Nature Conservation (DENC) also have the right to stop activities.

In all instances where costs are incurred in rectifying a breach of the EMPr, enforcing the provisions of the EMPr, or in taking remedial or preventative action to safeguard the environmental integrity, the costs will be recovered jointly or severally from the Principal Responsible Party, or the Contractor.

Should, however, a breach of the EMPr be as a direct result of negligence, an act, omission or failure to act on the part of the Employer, then the Employer may be responsible for the costs related to rectifying such breach. Note must be taken in this respect of Section 28 of NEMA which places a duty of care for environmental protection on "*every person who causes, has caused or may cause significant pollution or degradation of the environment*".

### 3.2.3 Record Keeping

Due to the severity of the potential implications for non-compliance, it is therefore necessary to keep proof of what happens on site. All records relating to the implementation of this management programme should be kept on site for the lifecycle of this project and shall be filed by the Contractor, Engineer, Operator and Proponent for a minimum of five years after cessation of activities. These records must be available for scrutiny by any relevant authority or delegated officials.

These records must include:

- Correspondence between the project team regarding environmental issues and appropriate measures to address any non-compliance.
- Any complaints raised by interested and affected parties, as well as the response provided by the Contractor/ Operator.
- Proof of disposal of general waste at the municipal landfill site or permitted treatment facilities.
- Method Statements provided by the Contractor and approved by the Project Manager.
- Instances of non-compliance, including steps taken to remedy the occurrence and prevent recurrence.
- Baseline photography of the site including georeferenced photographs of all areas that will be impacted by the construction activity and immediate surrounds. Where necessary, this photograph should indicate a relevant scale.

# 4 ENVIRONMENTAL MANAGEMENT PLAN

This chapter sets out the necessary practical mitigation measures to be undertaken to address the activities and potential impacts identified and assessed in the EIR and summarised in Section 2.3. The sections below provide the mitigation measures for each project phase, i.e. pre-construction, construction, operation and decommissioning. The final section of the EMPr provides a checklist of tasks to be undertaken in the case of temporary site closure (e.g. Builders' Holidays).

In the sections below, a table has been created for each identified activity, which provides the following information:

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| **Activity** | Describes the action to be undertaken by the implementer. |
| **Objective** | Describes the goal of environmental management, if the mitigation measures are implemented. |
| **Potential impact** | Lists the potential impacts that have been identified by the specialists during the impact assessment of the EIR. The symbols that follow the impact indicate if it is a negative impact or a positive impact. |
| **Mitigation measures** | Measures provided by the EAP and specialists to reduce potential negative impacts and enhance potential positive impacts. These measures have been broken into rows that separate responsibility and refer to different site actions (e.g. site demarcation and vegetation clearing). |
| **Responsibility** | Each action will fall under the responsibility of one of the roleplayers listed in Section 3.1. |
| **Timeframe** | An indication of when the actions must take place is provided. |
| **Monitoring method and frequency** | This section highlights the monitoring activities required by the ECO or other responsible party. |

## 4.1 PRE-CONSTRUCTION PHASE

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| **Activity** | Site layout finalisation and preparation for construction |
| **Objective** | To ensure that the design of the facility responds to the identified environmental constraints and opportunities. |
| **Potential impact** | No impacts associated with the pre-construction phase |

| **Mitigation measures** | **Responsibility** | **Implementation Timeframe** |
|---|---|---|
| COMPLIANCE AUDITING<br>• Appoint a suitably qualified independent ECO. This person should have appropriate experience of environmental management, and a good understanding of local fauna and flora. The ECO should be made aware of the potential occurrence of scientifically important fossil remains within the development footprint. The ECO should be able to make clear recommendations with regard to the management of disturbed areas. | Proponent/ECO | Tender<br>For duration of the construction period |
| METHOD STATEMENTS<br>• Method Statements must be submitted and approved prior to site establishment commencing.<br>• The content and required actions of the Method Statements must be communicated to site staff through the compulsory induction training.<br>• Refer to Section 5.1 below for the list of Method Statements required. | Submitted by Contractor, approved by ECO | Prior to site establishment |
| TERRESTRIAL AND AQUATIC HABITAT PROTECTION<br>• The mitigation measures addressing avifauna impacts related to overhead powerlines and trenching shall take precedence. There are no parts of the development footprint where trenches should not be allowed.<br>• Any changes to the road or turbine positions shall be confirmed by the ecological specialist.<br>• Pre-construction walk through of the approved development must be undertaken to ensure that all sensitive areas (habitats, species (flora, fauna and avifauna) and watercourses are avoided as far as possible. Areas considered more sensitive than others in this landscape include drainage channels and hilltop areas.<br>• All WEF infrastructure and temporary construction camps must be placed outside of the delineated waterbodies as highlighted in the aquatic specialist report (Annexure D of the EIR) (with the exception of unavoidable drainage line crossings by roads/ cables). These are illustrated in Figure 15 within the EMPr.<br>• Where highly sensitive areas do occur within the proposed construction footprint (based on Figure 15 and the walk through), these areas must be marked as no-go areas.<br>• Ensure that the laydown and other temporary infrastructure areas are located within low sensitivity areas, preferably areas that have previously been transformed. | Proponent/ Specialist / ECO | Prior to start of construction |

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| • A 200m no-go buffer must be provided around all identified water points as they serve as focal points for bird activity. In the case of the waterpoint located at 30°29'40.99"S 19°28'46.65"E the buffer zone may be relaxed to 150m to accommodate a stretch of road of 225m in length to prevent the road being pushed deeper into two drainage lines.<br>• The construction camp, laydown and stockpile areas may not be established within 100m of a watercourse or any other environmentally sensitive areas, unless agreed with the ECO<br>• Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However, caution should be exercised to avoid using material that might entangle fauna<br>• A large proportion of the impact of the development stems from the access roads and the number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible, as informed by a preconstruction walk-though survey. | | |
| AVIFAUNA & BAT CONSIDERATIONS<br>• Operational monitoring programme for the monitoring of bats must be designed ~~during the pre-construction phase~~ by a suitably qualified specialist, in accordance with the applicable guidelines in force at the time and informed by best available industry data.<br>• An Operational monitoring programme for the monitoring of birds must be designed prior to the commencement of the operational phase by a suitably qualified specialist, in accordance with the applicable guidelines in force at the time and informed by best available industry data. The operational monitoring programme can be developed during the pre-construction or construction phase.<br>• <u>All powerlines linking the turbines to the onsite substation must be buried, except where they need to traverse undisturbed areas or where technical, geotechnical or topographic constraints or energy losses prohibit the burying of the cables. In the case that the powerline is to be constructed aboveground, this consideration must be verified by a suitably qualified ecologist and/or geologist. The total length of MV overhead powerlines may not exceed the 22km length as assessed in the original lay-out, unless agreed otherwise with the avifaunal consultant during the finalisation of the detailed design.</u><br>• <u>The avifaunal specialist and the Endangered Wildlife Trust's (EWT) Wildlife and Energy Working Group must be engaged by the developer to provide input into the design of the proposed poles to be used, and they must approve the final design of all poles i.e. suspension poles, strain poles and terminal poles. This must include the physical inspection of a replica of an actual pole or a three-dimensional digital model, because the design drawings do not always show adequate technical details of aspects which could be highly dangerous for birds.</u> | Specialist | Prior to start of construction |
| ROADS AND TRAFFIC MANAGEMENT<br>• Traffic to the area should be planned for the construction phase, and should, as far as possible, be spread throughout the day to avoid adding strain to the current traffic in the area.<br>• A large proportion of the impact of the development stems from the access roads and the number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible, as informed by a preconstruction walk-though survey. | Proponent/ Contractor | Prior to start of construction |

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| • Where new watercourse crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion as well as minimise the loss of riparian vegetation. According to the aquatic specialist, Department of Water and Sanitation (DWS) has recommended in the past that low level causeways be used as these limits the potential impacts on erosion/ sedimentation.<br>• Appropriate stormwater management measures must be considered during the pre-construction period. These measures should include trapping sediments, and reducing flow velocities, as needed (Refer to Chapter 5.3.8 for further details). | | |
| ARCHAEOLOGICAL CONSIDERATIONS<br>• The final site layout must be considered by an archaeologist to ensure that known sites are safe from harm, and to confirm whether a follow-up survey or pre-construction walk-through may be required in certain areas. Should further studies be required, the resulting requirements (e.g. archaeological mitigation) should be met prior to the start of construction. | Proponent/ Design Engineers/ Specialist | Prior to start of construction |
| VISUAL CONSIDERATIONS<br>• Lights at night have the potential to significantly extend the project Zone of Visual Influence. Should the CAA indicate that lighting of selected turbines is required, light spillage reduction measures (relating to the structures) should be planned at the Pre-construction design phase and the feasibility of utilising radar technology to activate aircraft warning lights automatically should be considered (providing such a system is approved by the CAA). The radar technology, in conjunction with only placing aircraft warning lights on the key corner turbines and using direction specific warning lights, will assist in ensuring that the current dark sky of the surrounding rural agricultural sense of place is retained.<br>• No large signage or advertising should be planned or located on the wind turbines. | Proponent/ ECO | Prior to start of construction |

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| ELECTRO-MAGNETIC INTERFERENCE (EMI) CONSIDERATIONS<br>• During the selection of the final turbine, the EMI characteristics of prospective turbine models must be taken into consideration and used to guide the final turbine selection process, as per the EMC Control Plan compiled during the EIR (attached as Appendix E).<br>• Once the final turbine technology has been selected, the EMI emissions from the turbine shall be characterised, and if required a Technical Control Plan to mitigate emissions above the allowable SKA thresholds must be compiled and submitted to SKA for approval, as per the requirements of the EMC Control Plan (Appendix E).The EMC Control Plan will be made available by the holder of the environmental authorisation to the Square Kilometre Array South Africa (SKA-SA) for acceptance and will be submitted to the Department of environmental Affairs for approval prior to construction. Once approved by the SKA the Technical Control Plan, including all mitigation and monitoring measures must be implemented, and this must be considered during the design phase of the Wind Farm.<br>• Any transmitters that are to be established, or have been established, at the site for the purposes of voice and data communication will be required to comply with the relevant Astronomy Geographic Advantage Act regulations concerning the restriction of use of the radio frequency spectrum that applies in the area concerned. This must be considered and catered for as necessary in the design phase.<br>• It is recommended that *in situ* testing be undertaken on the Kokerboom 1 site before construction commences in order to characterize the existing ambient EMI emissions on site, to provide a baseline against which future testing (as specified in the Technical Control Plan) can be compared. | Specialist/ Proponent | Initiated with detailed design |
| PERMITS, APPROVALS AND LICENSES REQUIRED<br>• Relevant permits, approvals and/ or authorisations must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF), DWS, the Northern Cape Department of Environment and Nature Conservation (DENC) and Square Kilometre Array (SKA) prior to any construction activities at the site.<br>• Affected individuals of protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. This does not include trees which cannot be translocated and where these are protected by DAFF a permit for their destruction would be required.<br>• The design for the medium and high voltage powerlines must be submitted to the Eskom-EWT Strategic Partnership for approval to ensure that the design is bird-friendly.<br>• Once the turbine technology has been selected, a Technical Control Plan must be compiled by a suitable specialist in accordance with the high-level EMC Control Plan attached as Appendix E and submitted to the SKA for approval.<br>• The landowners must be consulted during the micro-siting and final design process, to ensure that farm infrastructure and farming activities are considered and accommodated. | Proponent/ ECO | Prior to start of construction |
| **Monitoring method and frequency** | | |
| Prior to the start of the construction period, the appointed ECO should confirm that the above-mentioned measures have been considered, and where possible implemented. | | |

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| The ECO shall undertake a pre-construction audit with photographic record of the condition of vegetation, watercourses and existing impacts within the construction footprint. This will be considered as the baseline for the project. |
| An approved construction footprint will be issued by the Engineer as a formal drawing. The Contractor shall request a formal revision of the drawing should a larger working/ construction area be required. The revision may only be issued subject to consultation with and written agreement from the ECO. The contract documentation shall make allowance for penalties in the case of negligence by the Contractor to comply with the requirements of the EMPr and to remain within the approved construction footprint. |
| Should a plant search and rescue be required, the ECO or appointed sub-contractor shall record the types of species collected as well as the number of specimens collected, the habitat they were removed from and their general condition |
| Where required, a Plant Rescue and Protection Plan should be submitted to the ECO for approval (see 5.3.2). |

| **Activity** | Proactive social measures | |
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| **Objective** | To reduce social risk to the project by enabling an appropriate grievance mechanism, and ensuring the construction team is appropriately trained | |
| **Potential impact** | No impacts associated with the pre-construction phase | |
| **Mitigation measures** | **Responsibility** | **Implementation Timeframe** |
| STAKEHOLDER ENGAGEMENT<br>• The proponent must ensure that appropriate stakeholder engagement is undertaken throughout the project, especially in the planning phase of the proposed Wind Farm infrastructure. This includes ensuring that the public participation process of the EIR is conducted appropriately.<br>• Surrounding communities must be kept informed, through appropriate channels of communication, of the commencement of construction.<br>• The proponent should consider the need for establishing a Monitoring Forum in order to monitor the construction phase and the implementation of the recommended mitigation measures. The Monitoring Forum should be established before the construction phase commences, and should include key stakeholders, including representatives from the Hantam LM, farmers and the contractor(s). The Monitoring Forum should also be briefed on the potential risks to the local community and farm workers associated with construction workers.<br>• The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF infrastructure will be compensated for, if evidence can be provided. The agreement should be signed before the construction phase commences. Costs may be recovered from the Contractor at fault, in accordance with the agreement between the Contractor and Proponent. In addition, the landowners should be encouraged to join the local Fire Protection Association.<br>• No workers should be permitted to trespass onto adjacent properties. Failure to adhere to this should be made a dismissible offence. In this regard contractors appointed by the proponent must ensure that construction workers who are found guilty of | Proponent/ Contractor/ECO | Project lifecycle |

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| trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct (see below). All dismissals must be in accordance with South African labour legislation.<br>• A grievance mechanism must be set up during the pre-construction phase to ensure that any issues that arise during the project timeline are appropriately dealt with.<br>• The Contractor must include contact details for complaints by members of the public on the site information boards.<br>• The Contractor must keep a "Complaints Register" on site. The register must include all contact information of the person who made the complaint, information regarding the complaint itself, as well as any measures or agreements made in resolution to such complaint.<br>• The Proponent should liaise with the Hantam Local Municipality to determine whether a database of local companies which may qualify as potential service providers. These potential service providers should focus on broad-based black economic empowerment (BBBEE) companies. The services relevant to the construction of the proposed Kokerboom 1 WEF infrastructure could include construction companies, catering companies, waste collection companies, security companies, accommodation, etc.).<br>• The Proponent should actively notify potential local service providers of the opportunity to bid for project-related work.<br>• Where possible, and permissible in terms of fair procurement policies, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.<br>• Before the construction phase commences the proponent should meet with representatives from the Hantam LM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.<br>• A local's first policy should be implemented to encourage Contractors to appoint local labourers as far as possible, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.<br>• The local authorities and relevant community representatives should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.<br>• The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.<br>• The Proponent should implement a policy that no employment will be available at the gate/ access point, or in Loeriesfontein (except for local residents) to avoid an influx of job seekers<br>• Good public relations are essential, and stakeholders that are potentially affected by noise impacts arising the project should be engaged with.<br>• Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties. | | |
| CODE OF CONDUCT<br>• The Contractor must develop a project specific Code of Conduct in consultation with representatives from the Monitoring Forum (if applicable). The code should identify which types of behaviour and activities are not acceptable. Construction | Contractor/ Monitoring Forum | Project lifecycle |

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| workers in breach of the code should be dismissed or subject to strict disciplinary action. All dismissals must comply with the South African labour legislation.<br>• The Code of Conduct must be signed by the proponent and contractor before contractors move onto site.<br>• The Code of Conduct, shall as a minimum include the following considerations:<br>  ○ No workers are permitted to trespass onto adjacent properties.<br>  ○ Employees of this project who are found guilty of stealing livestock and/ or damaging farm infrastructure must be dismissed and charged.<br>  ○ Waste management measures must be followed (detailed in Management of Construction Camp (Section 4.2)). Any employee found to be littering either on site, or whilst being transported to and from site should be fined.<br>  ○ Should a fire event be proven to be caused by a member of the project team and/or construction activities, the appointed Contractor will be liable to compensate the farm for any damage caused to their farm. The Contractor should also compensate the fire-fighting costs borne by farmers and local authorities.<br>  ○ All vehicles must be road-worthy, and drivers must be qualified and licensed. The drivers must be made aware of the potential road safety issues and the need for strict speed limits.<br>  ○ The Contractor must liaise with the affected farmers regarding the timing and location of construction activities so that they can make alternative arrangements for their sheep.<br>• Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. | | |

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| TRAINING AND AWARENESS<br>• Preconstruction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to. This includes awareness of harm caused by littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc. The proponent and contractor should also implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.<br>• Appropriate emergency training (e.g. firefighting) must be given to team prior to the construction period.<br>• The need to implement a training and skills development programme for local workers should be investigated prior to the initiation of the construction phase. The aim of the programme would be to maximise local employment opportunities.<br>• Ensure that noise as a component is included in the induction of employees and contractors, and how their activities and actions can impact on residents in the area (reverse alarms and reversing close to dwellings, driving fast past residential dwellings at night, maintenance of equipment). All contractors and employees should receive this induction.<br>• The Contractor must provide appropriate fire-fighting equipment on site and ensure that selected construction staff are appropriately trained for fighting fires.<br>• The project should be used to promote and increase the contribution of renewable energy to the national energy supply. | Contractor/ ECO | During site establishment |
| NOISE<br>• The potential noise impact must be evaluated again should the layout be changed where any wind turbines are located closer than 1,000m from a confirmed noise sensitive receptor. | | |
| **Monitoring** | | |
| Prior to the start of the construction period, the appointed ECO should confirm that the above-mentioned measures have been considered, and where possible implemented. | | |
| The details of the Monitoring Forum (if applicable) and Code of Conduct must be made available to the ECO, and a copy must be kept on site for the duration of the construction phase. | | |
| All relevant Method Statements should be provided to the ECO for review and approval prior to construction commencing. | | |

## 4.2 CONSTRUCTION PHASE

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| **Activity** | Site clearance for construction works (all components) | |
| **Objective** | To limit the extent of environmental degradation caused by the development footprint, and appropriately demarcate environmental sensitivities | |
| **Potential impact** | • Loss of vegetation cover and listed or protected species (-)<br>• Disturbance or harm to fauna (-)<br>• Increased erosion risk (-)<br>• Destruction of bat roosts (-)<br>• Loss of foraging habitat for bats (-)<br>• Displacement of avifauna due to construction related disturbance (-)<br>• Loss of riparian systems and disturbance to alluvial watercourses (-) | • Increase in sedimentation and erosion (-)<br>• Damage or destruction of archaeological resources (-)<br>• Damage and/ or destruction to palaeontological heritage resources (-)<br>• Increased risk of grass fires (-)<br>• Loss of agricultural potential (land) (-)<br>• Loss of grazing resources (social) (-)<br>• Cumulative impact of loss of avifaunal habitat due to human induced change (including renewable energy) (-) |

| **Mitigation measures** | **Responsibility** | **Implementation Timeframe** |
|---|---|---|
| SITE AND ROAD DEMARCATION<br>• <u>Any changes to the road or turbine positions shall be confirmed by the terrestrial ecology specialist.</u><br>• All construction areas must be clearly demarcated. For general demarcation (i.e. construction footprint), it is recommended that brightly painted white pegs/ poles reaching a height of 1.5m be placed at 5 to 10m intervals. The use of danger tape or orange netting or similar shall only be used to demarcate high risk areas (in terms of health and safety, or environmental sensitivity).<br>• If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.<br>• The construction camp area must be fenced off in such a way that access is controlled to avoid trespassers.<br>• Signage (refer to Environmental Awareness Section 5.4.1) must be erected at all site access points and shall comply with all applicable occupational health and safety requirements.<br>• Any potentially dangerous fauna such as snakes or fauna threatened by the construction activities should be removed to a safe location.<br>• Do not allow movement of people to the rest of property during the construction period. This will limit the disturbance of the natural environment to the construction footprint.<br>• No vehicular trampling of veld vegetation beyond road footprint. | Contractor/ ECO | Site establishment for construction phase |

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| • Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However caution should be exercised to avoid using material that might entangle fauna. | | |
| VEGETATION CLEARING AND TOPSOIL<br>• The mitigation measures addressing avifauna impacts related to overhead powerlines and trenching shall take precedence. There are no parts of the development footprint where trenches should not be allowed.<br>• Cleared vegetation may not be disposed of as waste at a landfill site.<br>• Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise impacts when rainfall does occur.<br>• Where possible, a low cover of vegetation should remain within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.<br>• To facilitate revegetation of denuded areas, topsoil should be stockpiled with seedbanks intact as far as possible, for use in the rehabilitation phase.<br>• Any excavation, including those for cables, must be supervised by the ECO or EO (or undertaken in accordance with an approved method statement). Disturbance of vegetation and topsoil must be kept to a practical minimum.<br>• Strip and stockpile topsoil from all areas where soil will be disturbed below surface. It is not necessary to strip topsoil from the whole development area, if the soil below surface is not being disturbed.<br>• All soil above the rock or hardpan should be stripped (to a maximum depth of 25cm) and stockpiled. Any additional soil overburden from below that depth must be stripped and stockpiled separately.<br>• Maintain stockpile shape and protect from erosion. Limit the height of stockpiles as far as possible in order to reduce compaction.<br>• All stockpiles must be positioned at least 32m away from watercourses, unless agreed otherwise with the ECO. | Contractor/ ECO | Construction Phase |
| LOSS OF AGRICULTURAL PRODUCTION POTENTIAL<br>• Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas to stabilise the soil against erosion.<br>• Implement an effective system of storm water run-off control using berms (raised, low walls of soil) and ditches, where it is required - that is at points where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.<br>• Strip and stockpile topsoil from all areas where soil will be disturbed below surface, for example excavations for cabling and mounting structures. It is not necessary to strip topsoil from the whole development area, if the soil below surface is not being disturbed.<br>• After cessation of disturbance, re-spread topsoil over the surface and re-vegetate. Any additional overburden must be re-spread below the topsoil layer, not mixed with it.<br>• Any subsurface spoils from excavations must be disposed of where they will not bury the topsoil of agricultural land. | Contractor | Construction phase |

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| STORMWATER MANAGEMENT<br>• Where required (such as areas where water may accumulate), implement an effective system of stormwater run-off control using berms (raised, low walls of soil) and ditches.<br>• The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and must prevent any potential down slope erosion.<br>• Site inspection must assess the effectiveness of the run-off control system and specifically record the occurrence (or not) of any erosion on site or downstream. | Contractor | Monthly during construction |
| AVIFAUNA AND BATS<br>• Adhere to the sensitivity map (Figure 15). Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist or in accordance with a rehabilitation plan compiled by such a specialist.<br>• A 200m exclusion zone should be implemented around the existing water points where no construction activity or disturbance should take place. In the case of the waterpoint located at 30°29'40.99"S 19°28'46.65"E the buffer zone may be relaxed to 150m to accommodate a stretch of road of 225m in length to prevent the road being pushed deeper into two drainage lines. | Proponent/ Contractor | Construction phase |
| DUST MANAGEMENT<br>• As far as possible, stockpile dust generating materials away from areas where dust will be a nuisance or hazard.<br>• Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.<br>• Dust generation must be visually monitored on a daily basis and control measures must be implemented when excessive dust generation occurs.<br>• Limit earthworks in sandy areas during windy conditions (i.e. winds above 40km/h).<br>• Control dust as per standard construction site measures which may include damping down with water or other appropriate and effective dust control measures. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site.<br>• Windblown dust during construction should be monitored by the EO and ECO. Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under authorisation of the ECO. | Contractor/ EO | Project Lifecycle |

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| IN THE CASE OF HERITAGE FINDS<br>• If there are any changes to the layout then these should be evaluated by an archaeologist and a report must be submitted to SAHRA for comment. No construction may commence without comment from SAHRA.<br>• Ensure that activities remain inside the authorised development footprint and that archaeological sites located outside of the footprint do not get inadvertently damaged or destroyed.<br>• During the construction phase, all major clearance operations (turbine foundations, pylons for internal transmission lines, access roads) and deeper (>1m) excavations should be monitored for fossil remains on an on-going basis by the ECO and/or EO.<br>• If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/John Gribble 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.<br>• If it is not possible to avoid the identified heritage resources, permits in terms of section 35 of the National Heritage Resources Act, Act 25 of 1999 (NHRA) and Chapter IV of the 2000 NHRA Regulations must be applied for in order to mitigate the sites prior to construction.<br>• The palaeontologist concerned with any mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).<br>• If the development receives an Environmental Authorisation (EA), SAHRA must be informed and all documents pertaining to the EA must be uploaded to the SAHRIS Case file. | Contractor/ ECO | Project lifecycle |
| **Monitoring method and frequency** | | |
| The ECO must be present during periods of excavation, vegetation clearance and site demarcation to monitor activities. | | |
| The ECO shall undertake weekly inspections of the construction works to monitor compliance with the abovementioned mitigation measures. The frequency of inspections can be reduced should a permanent EO be on site on a full-time basis. | | |
| Any faunal fatalities or incidents must be recorded and reported to the ECO. | | |
| The ECO should monitor the occurrence of any off-road vehicle tracks during construction. | | |

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| During construction dust generation must be visually monitored on a daily basis and control measures must be implemented when excessive dust generation occurs. Daily dust monitoring may be undertaken by the Construction Contractor's Environmental Officer and/or the Managing Engineer's Site Manager. The ECO must also monitor dust generation during each ECO site inspection. |
| A Plant Rescue and Protection Plan should be submitted to the ECO for approval, if search and rescue is required. |

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| **Activity** | Management of construction camp and behaviour of people | | | |
| **Objective** | To appropriately manage the behaviour and practices of the construction team | | | |
| **Potential impacts** | • Pollution of localised surface water quality with general and hazardous waste material (-)<br>• Creation of employment and business opportunities (+)<br>• Harm to social networks associated with presence of external construction workers (-)<br>• Harm to social networks associated with influx of job seekers (-)<br>• Risk to safety of farmers and farm workers, livestock and damage to farm infrastructure (-)<br>• Increase in dust (-) | • Increase in sound levels at the dwellings of receptors (-)<br>• Generation of litter and general waste pollution (-)<br>• Increase in traffic to area (local and regional) (-)<br>• Presence of large construction vehicles (including cranes) (-)<br>• Cumulative impact on local economy (+)<br>• Cumulative pressure on local services (-) | | |
| **Mitigation measures** | | | **Responsibility** | **Implementation Timeframe** |
| BEHAVIOUR WITHIN THE CONSTRUCTION CAMP FOOTPRINT<br>• Locks on service gates should be installed to prevent unauthorised access.<br>• No dogs or cats (or other domestic animals) should be allowed on site, except for the landowner and lawful occupants.<br>• If any parts of site, such as construction camps, must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. These should be directed downwards.<br>• All waste must go into the waste streams described below in Waste Management. No littering will be tolerated, as bits of plastic can be ingested by livestock and cause serious harm.<br>• Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised. These may not occur within drainage lines.<br>• No smoking shall be permitted near the storage of fuel and hazardous substances. Relevant signage shall be displayed.<br>• Strict control over the behaviour of construction workers, as it relates to the use, storage and disposal of hazardous substances and other pollutants when any work is required within any of the proposed crossings. | | | Contractor | Construction phase |

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| • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. Hazardous materials must be stored in compliance with material safety datasheet (MSDS) files, as defined by the ECO.<br>• All stored hazardous materials to be maintained within a bund and on a sealed surface. These storage areas must be inspected regularly to ensure bund stability, integrity and function.<br>• Containers with a volume of more than 20ℓ must have proper dispensing equipment.<br>• A spill kit able to contain 200ℓ must be kept at the construction camp. The spill kit must be fully stocked and easily accessible to the relevant, trained staff.<br>• The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded and stored in compliance with material safety datasheet (MSDS) files, as defined by the safety, health and environment (SHE) Representative / ECO.<br>• Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals must be complied with.<br>• Construction machinery must be stored in an appropriately secured area.<br>• During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.<br>• No open fires should be allowed within the site as there is a risk of runaway veld fires.<br>• Construction machinery must be inspected daily prior to commencement of works to detect any obvious hydrocarbon leaks. No maintenance of equipment shall take place outside of the construction camp. All maintenance shall be undertaken over a drip tray or on an impermeable surface.<br>• Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.<br>• Leaking equipment shall be repaired immediately or removed from the site.<br>• The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.<br>• Personnel should not be allowed to wander off the construction site.<br>• No unauthorized persons should be allowed onto the construction camp site and site access should be strictly controlled.<br>• Storage areas must be located more than 32m away from a watercourse, unless agreed otherwise with the ECO. | | |
| BEHAVIOUR OUTSIDE THE CONSTRUCTION CAMP FOOTPRINT<br>• The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.<br>• Personnel should not be allowed to wander off the construction site.<br>• All vehicles accessing the construction site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. | Contractor | Construction phase |

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| • No fuelwood collection should be allowed on site.<br>• Farm gates should always be secured or as per the land owner's wishes. Livestock should not be allowed to leave the property.<br>• No litter may be thrown out of windows during travel to and from site. A weekly clean up must be undertaken along the access road if litter is present.<br>• The Contractor shall take all reasonable measures to ensure the safety of people in the surrounding area, in terms of traffic and movement of people.<br>• Employee behaviour must be in line with the Code of Conduct (developed during the pre-construction phase). Construction workers in breach of the code should be dismissed or suitably disciplined. All dismissals must comply with the South African labour legislation.<br>• Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be enforced.<br>• All vehicles must stay on roads or existing tracks. Any transgressions will be finable as this reduces the availability of grazing land for the farmer.<br>• An incident/complaints register must be established and maintained on-site.<br>• Corrective action must be undertaken immediately if a valid complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. | | |
| ABLUTION FACILITIES<br>• Appropriate ablution facilities must be provided for construction workers during construction in accordance with the Occupational Health and Safety Act (Act 85 of 1998) (OHS).<br>• The Contractor may not allow temporary toilets to be erected within 100m of watercourses or wetland areas, unless agreed otherwise with the ECO.<br>• Toilets shall be in a ratio of 1 toilet for every 15 workers, or as per the OHS.<br>• Toilets shall be secured to the ground.<br>• The Contractor shall ensure that all chemical toilets are cleaned and emptied regularly, especially prior to any temporary site closure or long weekend.<br>• Proof of disposal of portable toilet content at a waste water treatment works must be retained on site. | Contractor | Construction phase |
| MANAGEMENT AGAINST EROSION AND SEDIMENTATION<br>• Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.<br>• Windbreaks and sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other soil waste heaps present during the wet season. | Contractor | Construction phase |

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| WASTE MANAGEMENT<br>• Potential sources of waste pollution must be used responsibly and strictly managed on site. An integrated waste management approach in accordance with the Waste Management Hierarchy must be implemented on site. This should aim to avoid, reduce, reuse, recycle, recover and treat waste where possible, where disposal is the last resort.<br>• Construction contractors must provide specific detailed waste management plans to deal with all waste streams.<br>• Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.<br>• Where possible, construction and general waste on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.). Supply waste collection bins at construction equipment and construction crew camps.<br>• In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents and the contaminated soil should be disposed of at a registered hazardous waste facility. Proof of disposal should be supplied to the ECO.<br>• Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal or storage (for surplus goods).<br>• All containers must have lids and be stored in a covered and bunded area or in a flammable/ hazardous store with a metal drip tray able to contain 110% of the volume of the largest container.<br>• Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.<br>• Any storage and disposal permits/ approvals which may be required, must be obtained, and the conditions attached to such permits and approvals must be complied with.<br>• Waste disposal records must be available for review at any time. Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste.<br>• Under no circumstances may solid waste be burnt or buried on site.<br>• Any contaminated water must be contained by means of careful run-off management. Any accumulated contaminated water (e.g. oil water from bunds) must be removed from site by licensed contractors.<br>• Any spills must receive the necessary clean-up action. If required, bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan). | Contractor | Construction phase |
| SOCIAL CONSIDERATIONS<br>• Where reasonable and practical the proponent should appoint local contractors, and implement a ‘locals first’ policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area; | Contractor / Proponent | Construction Phase |

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| • Where feasible, efforts should be made to employ suitably qualified and experienced local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;<br>• The local authorities and relevant community representatives should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.<br>• All personnel should undergo environmental awareness induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.<br>• The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.<br>• In the event of workers being accommodated in Loeriesfontein or other remote location, the contractor should provide transport to and from the site on a daily basis for workers. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site;<br>• Where necessary and feasible, the contractors should make the necessary arrangements to enable workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.<br>• No workers should be permitted to trespass onto adjacent properties. Failure to adhere to this should be made a dismissible offence, or subject to strict disciplinary action. In this regard contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.<br>• It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site. However, it is recognised that there may need to establish accommodation on site. If this is the case, then the movement of workers should be contained to the construction camp area after hours. | | |
| **Monitoring method and frequency** | | |
| The ECO must investigate records of waste removal, and complaints register. Penalties shall be recommended where driving has occurred off road. | | |
| A Fire Management Plan should be submitted to the ECO for approval. | | |

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| **Activity** | Construction of infrastructure (turbines, roads, buildings, substations, transmission lines) |
| **Objective** | To limit the degradation caused by the construction of infrastructure |
| **Potential impact** | • Displacement of avifauna due to construction related disturbance (-)<br>• Pollution of localised surface water quality with general and hazardous waste material (-)<br>• Disturbance to fauna (-) |

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| | • Increase in sedimentation and erosion (-)<br>• Increased risk of grass fires (-)<br>• Increase in dust (-)<br>• Increase in noise (-) |

| Mitigation measures | Responsibility | Implementation Timeframe |
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| ROADS AND TRAFFIC MANAGEMENT<br>• Footprint of new roads must be minimised as far as possible. Existing roads must be used where feasible to avoid further transformation of land and habitat destruction.<br>• Under no circumstances may vehicles traverse the site off roadways.<br>• Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads – or other effective measures - on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.<br>• Ensure appropriate stormwater and energy dissipation features are installed along the tracks and roads within the development footprint.<br>• Install properly sized culverts with erosion protection measures where site roads cross watercourses or drainage lines.<br>• All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.<br>• Signage on the Nuwepos Road should be moderated and natural colours used in the signage as much as possible.<br>• As far as possible, the transport of components to the site along the N7 should be planned to avoid weekends, holiday periods and the Spring Flower (typically August-September) season if possible.<br>• Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.<br>• The contractor must ensure that damage caused by construction related traffic to the Nuwepos Road and local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.<br>• All vehicles must be road-worthy, and drivers must be licensed and made aware of the potential road safety issues and need for strict speed limits.<br>• The Contractor should liaise with the affected farmers regarding timing and location of construction activities, so they can make alternative arrangements for any livestock which is using the area for grazing purposes and to avoid livestock interactions with construction traffic.<br>• The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined.<br>• The Contractor should be required to collect waste along the access road on a weekly basis. | Contractor | Construction phase |

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| EARTHWORKS AND BLASTING<br>• Prevent excessive noise generation during the day and night and record all noise complaints received from nearby receptors.<br>• Blasting should be minimised and used only when necessary to avoid disturbance to bats.<br>• Limit earthworks in sandy areas during windy conditions (i.e. winds above 40km/h) | Contractor | Construction phase |
| POLLUTION AND FIRES<br>• Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.<br>• The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels into the natural environment.<br>• No washing of equipment and plant may take place on bare soil. A wash bay should be constructed with an impermeable floor and a sump to separate hydrocarbons from water. No grey water may be released from the sump into the environment.<br>• Where unavoidable, emergency situations may require in situ maintenance of equipment or vehicles. This should occur in transformed footprints, away from drainage lines and a drip tray or other contained, impermeable surface must be used.<br>• All works relating to the use of hazardous substances must be undertaken over a drip tray.<br>• Refuelling shall only occur within the designated construction camp.<br>• Cement powder has a high pH. Spillage of cement powder and concrete slurry can therefore affect both soil and water pH significantly. The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. No batching shall occur directly on unprotected ground.<br>• Spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.<br>• All wastewater resulting from batching of concrete shall be taken back to the construction camp and disposed of appropriately.<br>• Empty cement bags, and other litter, shall not be permitted to be blown around the site.<br>• Where “readymix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes on site and allow grey water to flow on bare soil. Any spillage resulting from “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system. Readymix trucks shall not be permitted to dump drum wash on site, unless into a contaminated water pond within the construction camp, which must be fully rehabilitated at completion and the sediment collected for disposal.<br>• Windblown litter, construction debris and spoil shall be collected daily and removed for disposal via the construction camp.<br>• No uncontained (open) fires should be allowed within the site as there is a risk of runaway veld fires.<br>• Contractor to ensure that construction related activities that pose a potential fire risk, such as welding or other “hot works”, are properly managed and are confined to areas where the risk of fires has been reduced. | Contractor | Construction phase |

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| • Measures to reduce the risk of fires include avoiding "hot works" in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months.<br>• Contractor should provide adequate firefighting equipment on-site.<br>• Contractor should provide fire-fighting training to selected construction staff.<br>• As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors should compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities | | |
| AVIFAUNA AND BATS<br>• The powerlines should be marked with bird flight diverters (BFDs) for its entire length on the earth wire (HV) and conductors (MV) of the powerline, 5m apart, alternating black and white. See Appendix 2 for the type of BFD which is recommended.<br>• Do not allow any access outside of the site boundary during the construction period to avoid unnecessary disturbance to avifaunal and bat species.<br>• A 200m exclusion zone should be implemented around the existing water points where no construction activity or disturbance should take place. In the case of the waterpoint located at 30°29'40.99"S 19°28'46.65"E the buffer zone may be relaxed to 150m to accommodate a stretch of road of 225m in length to prevent the road being pushed deeper into two drainage lines. | Contractor | Construction phase |
| VISUAL CONSIDERATIONS<br>• The buildings should be natural coloured facebrick or painted a grey-brown colour (or other colour in keeping with the surrounding landscape) to assist in reducing colour contrast.<br>• Fencing should be simple and appear transparent from a distance. The fences should be checked on a monthly basis for the collection of litter caught on the fence. | Contractor | Construction Phase |
| NOISE<br>• The developer must investigate any reasonable and valid noise complaints if registered by a receptor staying within 2,000m from the location here construction activities are taking place. | | |
| **Monitoring method and frequency** | | |
| The ECO shall monitor compliance with the abovementioned mitigation measures. | | |
| During these inspections, the ECO shall conduct a visual inspection of each of the environmental aspects highlighted in this report. Any faunal fatalities or incidents must be recorded. | | |
| A Traffic and Transportation Management Plan should be submitted to the ECO for approval. | | |
| A Stormwater Management Plan should be submitted to the ECO for approval. | | |

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| **Activity** | Site rehabilitation of areas disturbed during the construction phase |
| **Objective** | To ensure that the areas disturbed during the construction phase are reinstated and temporary infrastructure is removed.<br>To reduce the long-term duration of construction phase impacts |
| **Potential impact** | • Increased risk of soil erosion (-)<br>• Visual obstruction of landscape to sensitive receptors (-) |

| **Mitigation measures** | **Responsibility** | **Implementation Timeframe** |
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| TEMPORARY INFRASTRUCTURE AND ROADS<br>• Upon completion of construction activities, all areas that are no longer required during the operational phase must be cleared and rehabilitated.<br>• The area must be cleared of all excess construction materials. All contaminated soil and waste should be disposed of at a registered hazardous waste site. Proof of such disposal must be kept on file by the Project Manager. The site must be cleared of litter and all general waste should be disposed of at a registered municipal landfill site.<br>• The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction, where practically possible.<br>• Compacted areas, such as roads, stockpile areas and construction platforms shall be ripped or scarified to a depth of ~300mm. | Contractor | Construction phase completion |
| SPOIL MANAGEMENT<br>• Any subsurface spoils from excavation must be disposed of where they will not bury the topsoil of agricultural land.<br>• Any additional overburden must be respread below the topsoil layer, and not mixed with it. | Contractor | Construction phase completion |
| TOPSOIL MANAGEMENT<br>• The topsoil that was stockpiled during the construction phase is to be used as topsoil cover during the rehabilitation process.<br>• If there is not enough topsoil for rehabilitation purposes, topsoil should be purchased and spread across all disturbed areas. | Contractor | Construction phase completion |

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| REVEGETATION<br>• Where there is likely to be a delay of greater than two weeks in the landscaping and revegetation of a disturbed area, or where the site is likely to be the subject of further construction activities at a later stage, the Contractor shall ensure that the area is temporarily revegetated or suitably stabilised in some other manner (e.g. straw worked into upper layer of soil) to combat dust generation and prevent erosion.<br>• This revegetation shall preferably occur incrementally immediately upon completion of the construction activities at the subject location. Should the revegetation of certain areas be done at a later stage due to finalisation of landscaping design and considerations, care should be taken to prevent soil erosion and windblown dust from exposed areas.<br>• The Contractor may not use herbicides, pesticides, fertilisers or other poisonous substances for the rehabilitation process, unless approved by the ECO.<br>• After seeding of the rehabilitated areas, if necessary the area should be irrigated to promote germination and vegetation establishment. If possible, this process should occur within the wet season to make use of natural rainfall.<br>• All rehabilitated areas shall be considered no-go areas and the Contractor shall ensure that none of his staff or equipment enters these areas. | Contractor | Construction phase completion |
| EROSION AND SEDIMENTATION<br>• Erosion channels formed during the construction phase must be backfilled and consolidated and the areas must be restored to a proper stable condition.<br>• No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped.<br>• Brush packing can be used in erosion channels or at drainage outlets. Alien vegetation may not be used for the purposes of brush packing.<br>• Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.<br>• No stormwater runoff must be allowed to discharge directly into any watercourse along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation.<br>• Stormwater from hard stand areas, buildings and substations must be managed using appropriate channels and swales when located within steep areas or have steep embankments.<br>• The Contractor shall undertake reasonable measures to prevent soil erosion of the rehabilitated areas. | Contractor | Construction phase completion |
| ALIEN PLANT MANAGEMENT<br>• All alien plant re-growth, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated.<br>• Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled. | Contractor | Construction phase completion |

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| • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible. | | |
| **Monitoring method and frequency** | | |
| Revegetation shall be considered successful once 80% basal cover with indigenous species has been attained. Cover will be measured by the ECO by means of quadrants/ plot sampling at regular intervals at the Wind Farm construction site. | | |
| Monitor culverts to see if erosion issues arise and if any erosion control is required. | | |
| All alien plant re-growth on site, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated. The Contractor shall remain responsible for removal of alien invasive plants during the defects and liability period and shall submit an Alien Invasive Management Plan to the ECO and Project manager for approval prior to practical completion. | | |
| All alien plant re-growth, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor | | |
| The ECO should audit the site at the end of the Contractor's retention period to establish whether rehabilitation has been successfully carried out. If not, the retention money should be used to implement additional rehabilitation measures. | | |
| A Revegetation and Habitat Rehabilitation Plan should be submitted to the ECO for approval. | | |
| An Open Space Management Plan should be submitted to the ECO for approval. | | |
| An Erosion Management Plan should be submitted to the ECO for approval. | | |
| Establish an effective record keeping system for each area where soil is disturbed below surface for construction purposes. These records should be included in environmental performance reports, and should include all the records below:<br>• Record the GPS coordinates of each area (if these are not already accurately recorded on site layout diagrams).<br>• Record the date of topsoil stripping and the location of where the topsoil is stockpiled.<br>• Record the date of cessation of construction (or operational) activities at the particular site.<br>• Photograph the area on cessation of construction activities.<br>• Record date and depth of re-spreading of topsoil.<br>Photograph the area on completion of rehabilitation and on an annual basis for at least two to five years thereafter to show vegetation establishment and evaluate progress of restoration over time This record keeping system must be established by the Contractor and handed over to Operator at end of the construction phase. | | |

## 4.3 OPERATIONAL PHASE

| | | | |
|---|---|---|---|
| **Activity** | Traffic on internal roads | | |
| **Objective** | To ensure that traffic is managed in order to prevent loss of life and damage to the environment | | |
| **Potential impact** | • Disturbance or harm to fauna (-)<br>• Pollution of localised surface water quality with general and hazardous waste materials (-) | | |
| **Mitigation measures** | | **Responsibility** | **Implementation Timeframe** |
| • All maintenance and rehabilitation works shall be undertaken in an environmentally responsible manner.<br>• All vehicle movements must be restricted to designated access or service roads.<br>• All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.<br>• Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.<br>• Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roads.<br>• All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.<br>• No washing of equipment and materials may take place on bare soil. A wash bay should be constructed with an impermeable floor and a sump to separate hydrocarbons from water. No grey water may be released from the sump into the environment.<br>• Use drip trays for all stationary or parked plant showing signs of leakage.<br>• All spills must be contained and adequately cleaned-up or treated *in situ.*<br>• All waste generated must be disposed of in accordance to the NEM:WA.<br>• Any areas disturbed during maintenance must be rehabilitated.<br>• Regular inspection of infrastructure (wind turbines, transmission lines and roads) must take place to ensure the infrastructure is in working condition.<br>• All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. | | Proponent / Operator | Operational phase |
| **Monitoring method and frequency** | | | |
| A Traffic and Transport Management Plan should be submitted to the ECO for approval. | | | |
| A Stormwater Management Plan should be submitted to the ECO for approval. | | | |

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|---|---|---|
| **Activity** | Generation and distribution of electricity (Operation) (all components) | |
| **Objective** | To minimise the impacts of the operating infrastructure on the receiving environment for the operating lifespan (approximately 20 years). | |
| **Potential impact** | • Increased risk of erosion (-)<br>• Alien plant invasion (-)<br>• Bat mortalities caused by attraction to turbines from artificial lighting (-)<br>• Increase in bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration) (-)<br>• Mortality of priority bird species due to collisions with the turbines (-)<br>• Change to downstream riparian form and function caused by impacts on drainage alteration (-)<br>• Increase in sedimentation and erosion (-)<br>• Creation of employment and business opportunities (+)<br>• Generate income for affected landowners (+)<br>• Establishment of a Community Trust (+)<br>• Potential impact on property values (-) | • Potential impact on tourism<br>• Increase of noise<br>• Increase of traffic to the area (local and regional) (-)<br>• Presence of large construction vehicles (including cranes) (-)<br>• Aircraft warning lights at night time (-)<br>• Presence of wind turbine on landscape (-)<br>• Cumulative effect of bat mortalities due to direct blade impact or barotrauma during foraging (resident and migrating bats affected) (-)<br>• Cumulative loss of sense of place (-)<br>• Cumulative impact on local services (-)<br>• Cumulative impact on local economy (+)<br>• Mortality of priority bird species due to electrocution on the internal overhead medium voltage powerlines (-)<br>• Mortality of priority bird species due to collision with internal medium and high voltage powerlines (-)<br>• Promotion of clean, renewable energy (+) |

| **Mitigation measures** | **Responsibility** | **Implementation Timeframe** |
|---|---|---|
| ARTIFICIAL LIGHTING<br>• If any part of the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects.<br>• No high exposure farm dwellings were identified, however, should local farm residential dwellings located within a three kilometre distance from the proposed project complain regarding the flashing of the lights at night, small to medium sized trees should be planted at the farm dwelling so as to screen off the night-time flashing of lights from the rural receptors. The recommended trees species is *Acacia karroo*, or similar that will grow to a medium height in this semi-arid environment. The tree plantings should be supervised by the WEFs environmental officer, or other suitably qualified person. Once planted, the maintenance of the trees is the responsibility of the farm owners / resident. Guidelines for planting trees are:<br>o Planting holes shall be appropriate for the size of tree being planted (e.g. 1m x 1m for a tree in a 10l plant bag).<br>o The trees should be positioned such that its roots do not touch the bottom of the hole, and the upper level of the plant is just below the surface to allow for water catchment. | Proponent / Operator | Operational phase |

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| ○ Lime, Bonemeal and a water retention polymer need to be added to each hole in the following quantities, or as recommended by the qualified individual overseeing the planting. For 4-10l bag plants:<br>▪ 175g Bonemeal;<br>▪ 250g Lime; and<br>▪ Polymer as per manufacturer specifications.<br>○ At the time of planting, the holes should not be filled with water.<br>• Where possible utilise lights with wavelengths that attract less insects (low thermal/infrared signature). If not required for safety or security purposes, lights should be switched off when not in use or equipped with passive motion sensors. | | |
| FAUNA<br>• Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.<br>• The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required.<br>• If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside. | Proponent/ Operator | Operational phase |
| SOIL EROSION<br>• Erosion management at the site should take place according to the Erosion Management and Rehabilitation Plan.<br>• No wind and water erosion on and downstream of the site as a result of run-off from the site.<br>• All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.<br>• All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow. | Proponent/ Operator | Operational phase |
| ALIEN PLANT INVASION<br>• An alien invasive management plan must be compiled for the operational phase (see 5.3.1)<br>• Wherever excavation is necessary, topsoil should be set aside and replaced after maintenance to encourage natural regeneration of the local indigenous species.<br>• Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled.<br>• Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. | Proponent / Operator / EO | Operational phase |

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| • Regular alien clearing should be conducted using the best-practice methods for the species concerned, in accordance with the alien invasive management plan. The use of herbicides should be avoided as far as possible | | |
| AVIFAUNA AND BATS<br>• An operational phase bat monitoring plan ~~study~~ must be implemented as soon as the facility ~~has been constructed~~ becomes operational.<br>• An operational phase avifauna monitoring ~~study~~ plan must be implemented as soon as the facility becomes operational.<br>• The minimum turbine tip height (ground clearance) should be at least ~~30 –~~ 40m to reduce the risk of Red Lark mortality during display flight activity.<br>• Depending on the results of the carcass searches, a range of mitigation measures will have to be considered if mortality levels turn out to be significant, including selective curtailment of problem turbines during high risk periods if need be.<br>• If turbines are to be lit at night, lighting should be kept to a minimum and should preferably not be white light. Flashing strobe-like lights should be used where possible (provided this complies with CAA regulations).<br>• Lighting of the wind farm (for example security lights) should be kept to a minimum. Lights should be directed downwards (provided this complies with CAA regulations) and be fitted with motion sensors as to switch off when not needed (if safe to do so).<br>• The overhead medium and high voltage transmission lines must be marked with bird flight diverters (BFDs) for their entire length on the earth wire (HV) and conductors (MV) of the powerline, 5m apart, alternating black and white. Refer to Appendix 2.<br>• All turbines should be subject to 90 degree feathering below the manufacturer's cut-in speed for every night so as to minimise unnecessary free-wheeling blade rotation as much as possible without locking the blades, as per the recommendation of the bat specialist. Relaxation of this requirement may be considered based on operational bat monitoring results and bat specialist input. | Proponent / Operator / EO | Operational phase |
| SOCIAL CONSIDERATIONS<br>• No unauthorised persons shall be allowed on site during the operational phase.<br>• Where feasible, the proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;<br>• The proponent, in consultation with the HLM, should investigate the options for the establishment of a Community Development Trust.<br>• The HLM should be consulted as to the structure and identification of potential beneficiaries of the Trust. The key departments in the HLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.<br>• Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. | Proponent | Operational Phase |

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| • Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the Wind Farm.<br>• The proponent should consider the establishment of a visitor center should the proposed Wind Farm be approved.<br>• The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000m from location during operation of the wind turbines. | | |
| **Monitoring method and frequency** | | |
| Bird mortalities are to be reported by the operator or EO to the specialist as and when they occur. | | |
| Formal bird monitoring should be resumed once the turbines have been constructed, as per the most recent edition of the best practice guidelines (Jenkins et al. 2011 – or future editions). The exact scope and nature of the post-construction monitoring will be informed on an ongoing basis by the result of the monitoring through a process of adaptive management. The purpose of this would be (a) to establish if and to what extent displacement of priority species has occurred through the altering of flight patterns post-construction, and (b) to search for carcasses at turbines.<br>As an absolute minimum, post-construction monitoring should be undertaken for the first two years of operation, and then repeated again in year 5, and again every five years thereafter unless monitoring results indicate an alternate monitoring programme would be more appropriate. The exact scope, nature and frequency of the post-construction monitoring will be informed on an ongoing basis by the results of the monitoring through a process of adaptive management | | |
| Formal bat monitoring should be resumed once the turbines ~~have been constructed~~ become operational, in accordance with the most recent industry guidelines applicable at the time. The exact scope, nature and frequency of the post-construction monitoring will be informed on an ongoing basis by the results of the monitoring through a process of adaptive management | | |
| Include site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site (monthly during construction; quarterly during operation). Photos of surface conditions showing absence or presence of erosion at all spots posing an erosion risk should be included in environmental performance reporting. | | |
| An Alien Invasive Management Plan should be submitted to the ECO for approval before the operational phase commences. | | |
| A Fire Management Plan should be submitted to the ECO for approval before the operational phase commences. | | |
| An Erosion and Rehabilitation Management Plan should be submitted to the ECO for approval, before the construction phase commences, and should be applied throughout the construction and operational phases. | | |

## 4.4 DECOMMISSIONING PHASE

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| **Activity** | Generation of electricity ceases and decommissioning of the site is undertaken | |
| **Objective** | To ensure that the decommissioning phase is appropriately planned for. | |
| **Potential impact** | • Disturbance or harm to fauna (-)<br>• Risk of soil erosion (-)<br>• Alien plant invasion (-)<br>• Displacement of priority bird species due to disturbance (-)<br>• Loss of riparian systems and disturbance to alluvial watercourses (-)<br>• Change to downstream riparian form and function caused by impacts on drainage alterations (such as hard or compacted surfaces (roads or hardstands) increasing surface runoff there by altering surface run off patterns) (-)<br>• Increase in sedimentation and erosion (-)<br>• Creation of employment and business opportunities (+) | • Harm to social networks associated with the presence of external construction workers (-)<br>• Harm to social networks associated with the influx of job seekers (-)<br>• Risk to safety of farmers and farm workers, livestock and damage to farm infrastructure (-)<br>• Increased risk of grass fires (-)<br>• Long term benefits associated with the Community Trust (+)<br>• Increase of noise (-)<br>• Increase in traffic to the area (local and regional) (-)<br>• Presence of large construction vehicles (including cranes) (-) |

| **Mitigation measures** | **Responsibility** | **Implementation Timeframe** |
|---|---|---|
| • All decommissioning activities must be undertaken in terms of the OHS Act and conducted in an environmentally responsible manner.<br>• All decommissioning activities must be restricted to the development footprint as far as possible. A pre-site investigation shall be undertaken to identify any sensitive areas that should be avoided.<br>• All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned.<br>• All structures should be removed and where possible, recycled. All materials must be removed from site.<br>• Any roads that will not be rehabilitated, should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Any roads that will not be used, must be closed and form part of the rehabilitation.<br>• All components that are associated with the project infrastructure, such as fencing, signs etc. must be removed from site.<br>• No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped<br>• All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. | Contractor/ Proponent | Decommissioning phase |

| | | |
|---|---|---|
| • All vehicles accessing the site should adhere to a low speed limit (40km/h max) on access and internal roads to avoid collisions with susceptible species such as snakes and tortoises.<br>• Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. | | |
| • All decommissioning activities must consider the measures associated with construction works and people management detailed for the construction phase in Section 4.2. | Everyone | Decommissioning phase |
| • A rehabilitation specialist should be appointed to guide a rehabilitation plan.<br>• All compacted areas should be ripped and then rehabilitated appropriately.<br>• There should be regular monitoring for erosion for at least 2 years after decommissioning by the Proponent and/or Contractor to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures.<br>• All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.<br>• All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.<br>• Regular monitoring for alien plants within the disturbed areas shall be undertaken for at least two years after decommissioning or until alien invasives are no longer a problem at the site.<br>• Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible. | Contractor/ Proponent/ Specialist | Decommissioning phase |

## 4.5 TEMPORARY SITE CLOSURE

If the site is closed for a period exceeding one week throughout the project lifecycle, the Contractor, in consultation with the Engineer shall carry out the following checklist procedure.

- Hazardous materials stores
    - Outlet secure/locked
    - Bund empty (where applicable)
    - Fire extinguishers serviced and accessible
    - Emergency and responsible personnel contact details displayed on site
    - Adequate ventilation in hazardous substance stores
- Safety
    - All trenches and manholes secured and closed or enclosed
    - Fencing and barriers in place
    - Material packs (e.g. pile of pipes) secured
    - Access gates locked and secured
- Erosion
    - Wind erosion and dust mitigation in place
    - Slopes and stockpiles at stable angle
    - Open soil re-vegetated or stabilised
- Water contamination and pollution
    - Cement and hazardous materials stores secured
    - Toilets empty and secured
    - Refuse bins empty and secured
    - Drip trays empty and secured (where possible)
    - Structures vulnerable to high winds secured

# 5 PLANS, PERMITS AND PROGRAMMES

Several plans, permits and programmes may be required through the duration of the project lifecycle. The requirements for these will be determined throughout the environmental impact assessment process through consultation with the authorities and may require amendments as the project proceeds. These have been briefly described below as follows.

- Method Statements
- Permits:
    - Water use license/registration; and
    - Removal/damage/translocation of protected floral species.
- Plans:
    - Alien Invasive Management Plan;
    - Plant Rescue and Protection Plan;
    - Avifauna Monitoring and Management Plan;
    - Bat Monitoring and Management Plan
    - Revegetation and Habitat Rehabilitation Plan;
    - Open Space Management Plan;
    - Traffic and Transport Management Plan;
    - Stormwater Management Plan;
    - Fire Management Plan; and
    - Erosion Management Plan.
- Programmes
    - Environmental Awareness Programme.

## 5.1 METHOD STATEMENTS

A method statement is a written submission from the Contractor to the Project Manager that requires the Contractor to apply their local knowledge to a site-specific issue, in line with the consulting recommendations of the Project Manager. This document is a written submission setting out the plant (i.e. the equipment, tools, machinery etc.), materials, labour and method that the Contractor proposes using to carry out an activity in line with the relevant specification. This enables the Project Manager, Proponent or ECO to assess whether the Contractor's proposal is compliant with the specifications or EMPr that have been prescribed for the project.

The Contractor will be required to provide several method statements to the Project Manager in terms of the tender documentation, which should include the following environmental considerations.

- Emergency procedures;
- Site division, demarcation and no-go areas (including site establishment, access, construction working widths, etc.);
- Site clearance and topsoil management;
- Stockpiling and laydown areas;
- Solid waste management (general and hazardous, including disposal);
- Hazardous substances storage and management;
- Contaminated water management and disposal;
- Cement storage and handling as well as concrete batching;
- Fuel storage and management;
- Ablution facilities and eating areas;

- Dust and noise/ nuisance control; and
- Protection of flora, fauna and natural features.

An example of a method statement form can be found in Appendix 3.

## 5.2 PERMITS

### 5.2.1 Water Use Authorisation

Section 21 of the National Water Act (Act 36 of 1998) recognises water uses that require authorisation by DWS before they commence. Construction of infrastructure within 32m of a drainage line will likely be required for the associated roads and Water Use License Application (WULA) is therefore required in terms of Section 21 (c) and (i). Alternately, water use may also be generally authorised in terms of Section 39 of the Act if that the water use complies with conditions set out in the specific General Authorisation which has been published in a Government Gazette. The General Authorisation for water uses as defined in Section 21(c) or (i) issued under GN 509 of 26 August 2016 defines the "regulated area of a watercourse" as:

- The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse; or
- A 500 m radius from the delineated boundary (extent) of any wetland or pan.

This requires that all activities undertaken within these regulated areas would have to be authorised in terms of this General Authorisation mentioned above.

The information required by the DWS for these applications has been included in the aquatic ecology assessment in Appendix D of the EIR. However, these applications will only be submitted if the project is awarded preferred bidder status in terms of the Renewable Energy Independent Power Producer Procurement (REIPPPP). No water use may begin without the appropriate authorisation.

### 5.2.2 Permit for protected species

It is important that any removal of indigenous vegetation and trees be managed according to the National Environmental Management: Biodiversity Act, Act 10 of 2004 (NEM:BA) to ensure that the proper procedures are followed when removing or damaging vegetation which could potentially be protected species. In addition, Government Notice 1002 of 2012 lists ecosystems which are threatened and in need of protection, GN R151 of 2007 lists all critically endangered, endangered, vulnerable and protected species and GN R152 of 2007 regulates all activities related to threatened or protected species. It is therefore recommended that a qualified ecologist confirm the species in need of protection and that a permit application be submitted to DENC for these species prior to disturbance, removal or relocation. This will be confirmed by the ecologist during the walk-through and shall be applied for prior to the construction phase.

## 5.3 PLANS

### 5.3.1 Alien Invasive Management Plan

Although alien invasive species are not currently an issue in the proposed project area, the movement of people and machinery through various areas could lead to the introduction and/or increase in prevalence in these areas. Furthermore, indigenous species may be out competed by invasive alien species in areas that have been disturbed by the project footprint.

All landowners, or custodians of land, have a duty of care in terms of Section 73 of the NEM:BA, Section 15 of the Conservation of Agricultural Resources Act (CARA) (No. 43 of 1983), the Alien and Invasive Species Lists (GN R864 of 2016) and the Alien and Invasive Species Regulations (GN R598 of 2014) to ensure that all alien

invasive species within the study area are recorded and an appropriate Alien Invasive Management Plan is compiled for these properties. GN R864 of 2016 lists all alien invasive species within South Africa and Chapter 2 of GN R598 of 2014 categorises the listed species and indicates how the different Category 1, 2 and 3 listed invasive species should be managed.

Using the above-mentioned legislation and regulations as guidelines, an Alien Invasive Management Plan must be implemented during construction and operation of the WEF. The plan must ~~should be drafted and approved by the ECO~~ that include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken. The Plan shall be drafted and approved by the ECO and must be made available to DEA and the relevant Competent Authorities on request.

### 5.3.2 Plant Rescue and Protection Plan

Limited endangered or endemic species were identified on site during the ecologist's site visits. During the walk-through to establish the final layout of the infrastructure, the ecologists should indicate if there are any specific plants that must be rescued or relocated from site for the construction and/or operational phase. The specialist must compile a Plant Rescue and Protection Plan that provides effective measures to successfully rescue and translocate the different species. The plan should also include permit requirements for protected floral species as indicated in Section 5.2.2 above.

This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and ~~should~~ be implemented prior to the commencement of the construction phase. The Plan must be made available to DEA and the relevant Competent Authorities on request.

### 5.3.3 Avifauna Monitoring and Management Plan

Twelve months of pre-construction avifaunal monitoring was conducted by a specialist from October 2015 to October 2016. Proactive mitigation measures were identified during this period and must be applied as detailed in Chapter 4 above. To ensure that the proposed mitigation measures are appropriate, post-construction monitoring must be undertaken by an avifaunal specialist in terms of the latest version of the Birds and Wind Energy Best Practice Guidelines applicable at the time monitoring commences (e.g. Jenkins *et al*. 2015 or future versions).

This plan should, as a minimum, include the monitoring of displacement of priority species, collision ratings, destruction of habitats, etc.

### 5.3.4 Bat Monitoring and Management Plan

Twelve months of pre-construction bat monitoring was conducted by a specialist from October 2015 to October 2016. Proactive mitigation measures were recommended and have been included in the environmental management plan above (Chapter 4). To ensure that these proactive mitigation measures do in fact reduce the number of bat mortalities caused by the wind farm, an operational monitoring programme must be implemented once construction is completed.

This monitoring programme must satisfy the conditions of the best practice guidelines and must be undertaken by a bat specialist.

### 5.3.5 Revegetation and Habitat Rehabilitation Plan

Restoration of land should be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery of natural habitats. According to the CARA, the landowner is responsible for maintaining the production potential of land, protecting natural vegetation and preventing the pollution of water resources as far as practicably possible. To enforce this responsibility, the Proponent (or Contractor, if so agreed between the Proponent and Contractor) should commission a Revegetation and Habitat Rehabilitation Plan for the Kokerboom 1 Wind Farm that should be implemented during the construction and operation of the facility. The objective of this Plan should be:

- To provide guidelines to prevent and manage certain environmental impacts, such as sedimentation, loss of topsoil and erosion of watercourse and wetland resources during the construction phase of the development;
- To provide rehabilitation measures to be implemented immediately after construction of river crossings;
- To provide measures to control alien vegetation and maintain soil integrity;
- To ensure adequate riparian vegetation cover within affected watercourses and to allow for suitable indigenous riparian vegetation to be reinstated within riparian and terrestrial areas adjacent to the river crossing affected by the development activities;
- To ensure the ongoing functioning and ecological service provision along important ecological corridors;
- To ensure that functionality and hydrological characteristics, such as water flow within the watercourses and drainage lines are maintained; and
- To provide suitable monitoring guidelines to ensure the long-term sustainability and determine the overall rehabilitation success of the rehabilitation works.

A botanist or ecologist with experience in arid environments should provide input into the rehabilitation plan. Measures should be provided which enable the successful revegetation of disturbed areas. The area should then be photographed on completion of rehabilitation and on an annual basis (for two to five years or as recommended by the botanist/ecologist) thereafter to show vegetation establishment and evaluate progress of restoration over time. It is also important to recognise that this Plan should be closely aligned with the Erosion Management Plan (Section 5.3.10) as the two factors are inextricably linked. The Plan must be made available to DEA and the relevant Competent Authorities on request.

### 5.3.6 Open Space Management Plan

The DEA has developed a Greening and Open Space Management project with the aim to ensure that the use of greener technology is enhanced, and that land use planning and environmental planning decisions are strengthened through the incorporation of the alternative energy sources, biodiversity and ecosystems aspects in the local government planning processes. In support of this initiative the Proponent (or Contractor and/or Operator, if so agreed between the Proponent and the Contractor and/or Operator) should develop an Open Space Management Plan aimed at:

- Implementing measures towards pollution mitigation;
- Minimising biodiversity loss;
- Encouraging the use of greener technologies; and
- Restoring, enhancing and rehabilitating available open spaces.

This plan should identify initiatives for sustainable use of all open spaces within the site boundary and should be implemented during the construction and operation of the facility The open space management plan may be integrated into the Revegetation and Habitat Rehabilitation Plan (Section 5.3.5), if appropriate.

### 5.3.7 Traffic and Transportation Management Plan

A Traffic Management Plan must ~~should~~ be drafted for the site access roads to ensure that no hazards would result from the increased site-related truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations. This plan should incorporate all legal requirements in terms of the National Road Traffic Act (NRTA), Act 93 of 1996, and all relevant regulations.

According to the Transport Assessment undertaken for the Kokerboom 1 Wind Farm (included in Annexure D of the EIR), the routes which would be used for transport of construction material are predominantly on National or Provincial Roads, with suitable conditions for the transport of normal freight, or abnormal loads.

The NRTA and associated regulations prescribe the permissible vehicle dimensions and masses of vehicles travelling on public roads. Where vehicles will exceed these requirements and where the load cannot be dismantled without significant cost / effort, it must be classified as an abnormal load and an exemption must be obtained in terms of section 81 of the NRTA. For this reason, the transportation of transformers, main assembly cranes and turbine components for the WEF would require the application of abnormal permits. A Transportation Plan should be compiled by the Contractor to guide this process and to establish the best possible solutions for safe and cost effective transportation of construction materials.

### 5.3.8 Stormwater Management Plan

A stormwater management plan must be developed by the civils contractor based on the detailed design of the site and implemented during the construction phase of the project. The Proponent/ Operator should develop an appropriate stormwater management plan for the operational phase of the project, based on the outcomes of the construction process. This plan shall comply with the Department of Water Affairs and Forestry's (DWAF) Best Practice Guideline (G1) for Stormwater Management (2006) and GN 704 (Government Gazette 20118 of June 1999). The plan should ensure compliance with applicable regulations and prevent off-site migration of contaminated stormwater or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater run-off.

### 5.3.9 Fire Management Plan

A Fire Management Plan should be drafted and should comply with all legal requirements in terms of the National Veld and Forest Fire Act, Act 101 of 1998 as well as the National Forest and Fire Laws Amendment Act No. 12 of 2001. This plan should be implemented during the construction and operation of the facility and should be guided by the following objectives:

- Preventing undesired wild fires;
- Implementing monitoring and reporting of fires on site;
- Providing all construction and operational staff with basic information about fire management for their safety and awareness; and
- Listing contact details and equipment relating to firefighting.

### 5.3.10 Erosion Management Plan

An effective erosion and rehabilitation plan must be developed by the civils Contractor based on the detailed design of the site and implemented during the construction phase. The Proponent/ Operator should develop an appropriate erosion management plan for the operational phase of the project, based on the outcomes of the construction and rehabilitation process. The erosion management plan should recommend proactive measures to reduce the risk of erosion becoming a problem on site. It has been recommended by the agricultural specialist consulted during the Scoping Phase, that an effective record keeping system for each area where soil is disturbed below surface for construction purposes should be established. These records should be included in environmental performance reports, and should include all the records below:

- Record the GPS coordinates of each area;
- Record the date of topsoil stripping;
- Record the GPS coordinates of where the topsoil is stockpiled;
- Record the date of cessation of construction (or operational) activities at the particular site;
- Photograph the area on cessation of construction activities; and
- Record date and depth of re-spreading of topsoil.

## 5.4 PROGRAMMES

### 5.4.1 Environmental awareness programme

It is crucial that each employee and visitor to the site is aware of the impact that their actions may have on the environment. Each employee will be required to attend an environmental awareness training session as induction to the site, and ongoing toolbox talks and sharing of lessons learnt are encouraged. Passive environmental awareness measures should also be implemented such as having informative posters placed around the construction camp, and appropriate signage where necessary (such as no-smoking signs near fuel storage areas). Emergency procedures should also be provided for in this environmental awareness plan.

#### 5.4.1.1 Training

All employees and site personnel must undergo environmental awareness training at the start of the project. Each attendee must sign an attendance register on completion, and this must be kept by the Contractor and Project Manager. All employees and site personnel must be made aware of this EMPr and their role in the implementation of it.

An example of a presentation that may be used for training is appended to this report as Appendix 4. The ECO will provide the training and may provide the material. As a minimum, the following condition must be included:

- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.

The social specialist recommended that the construction workers should be educated about their expected behaviour, and the dangers of contracting sexually transmitted diseases such as HIV/Aids. The EAP recommends that this be included in the training required by the OHS.

#### 5.4.1.2 Emergency procedures

The Contractor team must adhere to the OHS. In case of an emergency occurring on site, the team must react efficiently to reduce the potential impact. Emergencies on a construction site may include physical harm/ death; fire; spills or leakages.

A method statement must be provided by the Contractor for the emergency procedures for fire, accidental leaks and spillages of hazardous materials. This must include:

- Who shall be notified in the event of an emergency, including contact numbers for the relevant authority;
- Where and how any hazardous spills will be disposed of;
- The size of spillage which the emergency procedures could contain;
- Location of all emergency equipment and an indication of how regularly the emergency equipment will be checked to ensure that it is working properly.

Contact information for the emergency services in the area must be displayed in an accessible location. Appropriate emergency training (e.g. fire-fighting, first aid, etc.) must be given to members of the construction team prior to the construction period.

An incident/ complaints register must be established for emergencies and maintained on-site. Record of near misses should also be made. Corrective action must be undertaken immediately if a complaint is received, or a leak or spill, fire or injury is identified

# Appendices

# Appendix 1
# EAP Curriculum Vitaes

# Appendix 2
# Bird Flight Diverters

# Appendix 3
# Template for Method Statements

# Appendix 4
# Example of Environmental Awareness Training

# Appendix 5
# EMC Control Plan

**Aurecon South Africa (Pty) Ltd**
Reg No 1977/003711/07
Aurecon Centre
1 Century City Drive
Waterford Precinct
Century City
Cape Town 7441
PO Box 494
Cape Town 8000
South Africa

**T** +27 21 526 9400
**F** +27 21 526 9500
**E** capetown@aurecongroup.com
**W** aurecongroup.com

**Aurecon offices are located in:**
Angola, Australia, Botswana, China, Ghana, Hong Kong, Indonesia, Kenya, Lesotho, Macau, Mozambique, Namibia, New Zealand, Nigeria, Philippines, Qatar, Singapore, South Africa, Swaziland, Tanzania, Thailand, Uganda, United Arab Emirates, Vietnam.

# Appendix 1
# EAP Curriculum Vitae

# Franci Gresse

**Qualifications**

BSc (Hons) Conservation Ecology

Member, International Association of Impact Assessment (IAIA)

**Specialisation**

Environmental Impact Assessment Practitioner

**Years in industry**

10

Franci is a senior environmental practitioner in Aurecon's Cape Town office. She has been involved in various environmental investigations, including environmental impact assessments (EIA's), environmental management plans (EMP's), environmental management programmes (EMP's), rehabilitation plans maintenance management plans (MMP's) and fatal flaw analysis.

Franci has been involved with the Working for Wetlands rehabilitation programme for the past five years, of which she has been acting as the Team Leader for the environmental assessment practitioners (EAP's) for the last three years. The Working for Wetlands project won the 2012 Aurecon Chairman's Award for its positive contribution to the natural and social environmental. In addition, Franci has also been involved with a number of projects in the renewable energy sector.

Franci served on the committee of the South African affiliate of the International Association for Impact Assessment (IAIA) for the Western Cape Branch from 2009 to 2011, and remains a member. She completed a Bachelor of Science and an Honours Degree in Conservation Ecology at the University of Stellenbosch (South Africa).

## Experience

**Alien Invasive Species Management for the Witzenberg Local Municipality, Western Cape Province, South Africa, Witzenberg Local Municipality, 03/2017-06/2017, Project Staff**

The project was to deliver an Invasive Species Strategy that would provide a framework to allow the municipality to fulfil its responsibilities in managing and controlling invasive alien species on land under its jurisdiction. The project included the compilation of two Invasive Species Monitoring, Control and Eradication Plans, as well as a workshop process to engage with key stakeholders.

**Working for Wetlands plan 2016 - 2018, Regional South Africa, Department of Environmental Affairs: Natural Resource Management Directorate, 06/2016 - Date, Project Leader**

The Natural Resource Management Directorate of the Department of Environmental Affairs appointed Aurecon to provide environmental and engineering services for the Working for Wetlands Programme which is a national wetland rehabilitation programme. Responsibilities include the management and coordination of the overall project, management of the environmental authorisation component of the project, as well as the compilation of basic assessment reports (BAR) for the country. Other responsibilities include the compilation of wetland rehabilitation plans for the Western Cape, Northern Cape and Limpopo Provinces, liaison with authorities and the public (public participation process) and management of wetland specialists.

**Integrated Environmental Impact Assessment (EIA) for the proposed extension of the Ash Dam facility at Kriel power station, Mpumalanga Province, South Africa, Eskom Holdings, 06/2016 - date, Project Leader**

Appointed by Eskom to conduct an integrated environmental impact assessment (EIA) for the proposed construction of a fourth ash dam facility at the Kriel power station. Responsible for the general project management and finances, authority liaison and the compilation and review of the EIA documentation.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Amended Environmental and Socio-Economic Impact Assessment for a concentrated solar plant facility near Arandis in the Erongo Region, 02/2016 – 10/2016, Project Leader**

Aurecon was appointed by the NamPower to amend the Environmental Clearance Certificate (ECC) issued for the Erongo Coal-fired Power Station at Arandis, to a Concentrated Solar Plant. Responsibilities included project management (programme, finances and client expectations), liaison with authorities and relevant stakeholders, review of specialist reports and the compilation and review of the Amendment Report.

**Table Mountain Group (TMG) Aquifer feasibility study and pilot project, Western Cape Province, South Africa, City of Cape Town, 2015 - 2017, Environmental Consultant**

The TMG Aquifer Feasibility Study and Pilot Project was initiated in 2002 and is a long term planning initiative to investigate the groundwater potential of the TMG Aquifer as a water source to augment Cape Town's water supply. Given the recommendations in the Exploratory Phase report, and the fact that the TMG Aquifer has since been utilised as a water resource in areas such as Hermanus and Oudtshoorn, the City of Cape Town decided to omit the Pilot Phase and rather proceed with an extended Exploratory Phase, which would include limited pump testing. Aurecon was appointed n to undertake the extended Exploratory Phase work. Responsibilities include the compilation of Environmental Management Plans for the additional test sites, liaison with the relevant authorities and landowners and management of the Environmental Control Officers on the project.

**Implementation of the Hoekplaas environmental authorisation (EA), Northern Cape Province, South Africa, Mulilo Renewable Energy, 11/2013 - 05/2015, Project Leader**

Aurecon assisted the holder of the environmental authorisation (EA) for the 100 MW photovoltaic (PV) facility in De Aar with the implementation of the environmental conditions to ensure compliance to all relevant environmental legislation. Responsible for the management of tasks and review of all documentation. Also assisting client with questions on the environmental impact assessment (EIA) process.

**Environmental impact assessment and compilation of an environmental management plan (EMP) for the Swakopmund-Mile 7 Water Supply, Phase 2, Swakopmund, Namibia, NamWater, 11/2013 - 10/2015, Project Leader**

NamWater appointed Aurecon to assist with the environmental impact assessment process for the proposed construction of a new bulk water pipeline between Swakopmund and Mile 7. Responsible for the management and review of the environmental impact assessment (EIA) reports and processes, as well as the project's finances.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Working for Wetlands plan 2014 - 2016, Regional South Africa, South African National Biodiversity Institute (SANBI), 06/2013 – 05/2016, Task Leader**

The South African National Biodiversity Institute (SANBI) appointed Aurecon to provide environmental and engineering services for the Working for Wetlands Programme which is a national wetland rehabilitation programme. Responsible for the management of the environmental authorisation component of the project, as well as the compilation of basic assessment reports (BAR) for the country. Other responsibilities include the compilation of wetland rehabilitation plans for the Western Cape, Northern Cape, North West and Limpopo Provinces, liaison with authorities and the public (public participation process) and management of wetland specialists.

**Maintenance management plans (MMP's) for flood damaged road infrastructure, Western Cape Province, South Africa, Western Cape Provincial Government Department of Transport and Public Works, 06/2013 - Date, Project Staff**

The project entails the compilation of maintenance management plans (MMP's) for two local municipal areas (Laingsburg and Worcester), as well as obtaining the necessary permits/ water use authorisations. Personally involved during the project commencement with regards to strategy development, meetings with the relevant authorities and assistance with the development of the MMP's.

**Environmental impact assessment (EIA) for the expansion of approved solar energy facilities located near Prieska and De Aar, Northern Cape Province, South Africa, Mulilo Renewable Energy, 03/2013 - 09/2015, Phase Leader**

Mulilo Renewable Energy decided to expand the approved solar energy facilities on the farms Hoekplaas and Klipgats in Prieska, as well as on the farms Badenhorst Dam and Du Plessis Dam in De Aar. The expasion of Hoekplaas farm in Prieska includes ten additional 75 MW photovoltaic (PV) facilities and six additional PV units at Klipgats Pan farm. The expansion at Badenhorst Dam farm includes four additional 75 MW PV facilities and three additional PV units at Du Plessis Dam farm. Responsible for the management and review of the environmental impact assessment (EIA) reports and processes, as well as the project's finances.

**Fatal flaw study for two potential Wind Energy Facility (WEF) sites, Northern and Western Cape Provinces, South Africa, Juwi Renewable Energies (Pty) Ltd, 03/2013 - 04/2013, Environmental Practitioner**

The study entailed a fatal flaw analysis of two potential wind energy facility (WEF) sites in the Northern and Western Cape Provinces. Responsible for the assessment of the sites and compilation of the fatal flaw report.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Richtersveld wind energy facility (WEF), Northern Cape Province, South Africa, TRE Tozzi Renewable Energy S.p.A and Guma Group, 07/2012 - 09/2013, Environmental Practitioner**

The project entailed a due diligence of the proposed wind energy facility (WEF) to review compliance with the requirements of the Department of Energy's independent power producer (IPP) process. Responsible for the review of the environmental reports and compilation of the due diligence report.

**Three photovoltaic (PV) energy facilities near Copperton, Northern Cape Province, South Africa, Mulilo Renewable Energy (MRE), 09/2011 - 05/2015, Environmental Practitioner**

The project entailed three environmental impact assessments (EIA's) for three photovoltaic (PV) energy facilities comprising 75 MW to 150 MW, located near Copperton. Responsible for the management the EIA process and project specialists, compilation of scoping and EIA reports and liaison with authorities.

**Fatal flaw study for four potential wind energy facility (WEF) sites, Northern and Western Cape Provinces, South Africa, Mainstream Renewable Power South Africa, 11/2011 - 05/2012, Environmental Practitioner**

The study entailed a fatal flaw analysis of four potential wind energy facility (WEF) sites across the Northern and Western Cape Provinces. Responsible for the management of specialists, review of reports, assessment of the sites and compilation of the fatal flaw report.

**Implementation of the Klipgats Pan environmental authorisation (EA), Northern Cape Province, South Africa, Mulilo Renewable Energy, 09/2011 - 05/2015, Project Leader**

Aurecon was appointed to undertake three environmental impact assessments (EIA's) for three proposed phtovoltaic (PV) solar energy plants near Copperton. The first PV solar energy plant will generate around 100 MW (preferred alternative) or 150 MW (alternative) on the Hoekplaas Farm (Farm 146/RE). The proposed PV plant will cover approximately 300 ha (preferred alternative) or 450 ha (alternative). The second includes a PV solar energy plant to generate roughly 100 MW on the farm Klipgats Pan (Farm 117/4) near Copperton in the Northern Cape. The proposed PV plant will cover an estimated 300 ha. An alternative site for a 100 MW PV plant with a 300 ha footprint is also being considered. The third comprises a PV solar energy plant to generate about 100 MW (preferred alternative) or 300 MW (alternative) on the farm Struisbult (Farm 104, portion 1) which will cover 300 ha to 900 ha. Responsible for managing tasks and reviewing all documentation for updating the environmental management plan (EMP) and implementing the environmental authorisation (EA). Also assisted client with questions on the EIA process.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Proposed rehabilitation of Wetlands as part of the Working for Wetlands, Regional, South Africa, South African National Biodiversity Institute (SANBI), 08/2011 - 09/2013, Environmental Practitioner**

Appointed by the South African National Biodiversity Institute (SANBI) to conduct environmental impact assessments (EIA's) for the rehabilitation of specific wetlands in all provinces of South Africa over a five year period. Responsible for the compilation of basic assessment reports (BAR) and Wetland Rehabilitation Plans for the Western Cape, Northern Cape, Gauteng and Limpopo Provinces. Other responsibilities included liaison with authorities, public participation process, management of specialists and general project management of the environmental component of the project.

**Repair of flood damage to road structures in the Eden District Municipality, Western Cape Province, South Africa, Western Cape Provincial Department of Transport and Public Works, 01/2011 - Date, Environmental Practitioner**

The project entails the compilation of maintenance management plans (MMP) for seven areas with the Eden District Management Area to repair. Responsible for compilation of MMP's, review of reports and liaison with stakeholders and authorities.

**Environmental impact assessment (EIA) for the proposed extension of the Ash Dam facility at Kriel power station, Mpumalanga Province, South Africa, Eskom Holdings, 11/2009 - 12/2015, Environmental Practitioner**

Appointed by Eskom to conduct an environmental impact assessment (EIA) for the proposed construction of a fourth ash dam facility at the Kriel power station. Responsible for the general project management and finances, screening process, compilation of the scoping and EIA reports, public participation and the compilation of a waste management licence application.

**Environmental impact assessment (EIA) for proposed relocation of solar energy facility, Onder Rietvlei Farm, Aurora, Western Cape Province, South Africa, Solaire Direct Southern Africa, 2010 - 2011, Project Leader**

Appointed by Solaire Direct to undertake a basic environmental impact assessment (EIA) process for the proposed relocation of an approved, but not yet constructed 10 MW solar energy facility. Responsible for the management and review of the EIA process and finances.

**Environmental impact assessment (EIA) for proposed solar energy facility, Onder Rietvlei Farm, Western Cape Province, South Africa, Solaire Direct Southern Africa, 07/2010 - 02/2012, Environmental Practitioner**

Appointed by Solaire Direct to undertake a basic environmental impact assessment process for the proposed construction of a 10 MW solar energy facility. Responsible for the compilation of the draft and final reports, public participation process, management of specialists and general project management.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Proposed Paarl Mountain and Ysterbrug pumping main upgrades, Western Cape Province, South Africa, Drakenstein Municipality, 06/2010 – 12/2015, Environmental Advisor**

The Drakenstein Municipality appointed Aurecon's engineers to investigate and plan the proposed upgrade of the Paarl Mountain and Ysterbrug Pumping Scheme. The upgrading of the pipelines feeding the Meulwater Water Treatment Works from the Bethel and Nantes dams, also part of this scheme, was also investigated. Responsible for providing advice on environmental processes required. Other responsibilities included the management of the independent environmental assessment practitioner and the review of all environmental impact assessment (EIA) documentation.

**Environmental sensitivity study (ESS) for a proposed solar energy facility on a farm Near Aurora, Western Cape Province, South Africa, Solaire Direct Southern Africa, 2010, Environmental Practitioner**

Appointed to provide and environmental sensitivity study (ESS) which inter alia highlights the potential constraints ('red flags') and opportunities presented by the site from an environmental perspective. Responsible for the compilation of the ESS.

**Proposed remediation, rehabilitation and restoration of the Spruit, Krom, Leeu and Palmiet Rivers, Western Cape Province, South Africa, Drakenstein Municipality, 2009 - 2010, Environmental Practitioner**

Appointed by the Drakenstein Municipality to undertake the requisite environmental impact assessment (EIA) process for the rehabilitation, remediation and stabilisation of four rivers in Paarl and Wellington. Responsible for the EIA and public participation processes.

**Proposed construction of a new pipeline from Bovlei Winer to Withoogte Dam, Wellington, Western Cape Province, South Africa, Drakenstein Municipality, 2009 - 2010, Environmental Practitioner**

The Drakenstein Municipality proposed to replace a section of the existing pipeline extending from the Withoogte Dam to the Welvanpas Reservoir near Wellington as part of the municipality's water master plan in order to improve the overall water supply. Responsible for the compilation of the environmental impact assessment (EIA) report, management of specialists and the public participation process.

**Proposed erection of Eskom communication sirens and public anouncement (PA) systems, Blaauwberg, Western Cape Province, South Africa, Eskom, 2009 - 2010, Environmental Practitioner**

The project entailed three environmental impact assessment (EIA) processes for the (a) erection of 10 new sirens in the Parklands area, (b) the relocation of one siren in Bloubergstrand, and (c) the upgrade of five sirens on farms near Melkbosstrand. Responsible for compiling environmental impact assessment (EIA) reports, and the public participation process.

**Overberg District Municipality integrated transport plan (ITP) strategic environmental informants, Western Cape Province, South Africa, Overberg District Municipality, 2009, Environmental Practitioner**

Aurecon's Transportation Unit was appointed to revise the integrated transport plan (ITP). The Environmental Unit was subcontracted to provide environmental input. Responsible for identifying and describing the relevant informants.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Annandale Commercial: development of petrol filling station on portion of Erf 5561, Kuils River, Western Cape Province, South Africa, Communicate, 2009, Environmental Practitioner**

Appointed to compile a construction environmental management plan (CEMP) for the construction of a filling station on the corner of Gladioli Street and Amandel Drive, Kuils River. Responsible for the compilation of the project specification document as part of the CEMP.

**Environmental impact assessment (EIA) for the proposed Langezandt Quays development in Struisbaai Harbour, Western Cape Province, South Africa, Golden Falls (Pty) Ltd, 2008 - Date, Environmental Practitioner**

Aurecon was appointed to undertake an environmental impact assessment (EIA) process for the proposed development of a four storey development on Erf 848 within the Struisbaai harbour precinct. Responsible for drafting responses to the Department of Environmental Affairs' independent review report on the proposed development.

**Pre-feasibility and feasibility studies for augmenting the Western Cape water supply system, South Africa, Department of Water Affairs (DWA), 2008 - 2013, Project Staff**

The Department of Water Affairs commissioned pre-feasibility and feasibility studies for the augmentation of the Western Cape water supply system through the further development of the surface water resources. Surface water schemes to be investigated were identified by the Western Cape water supply system reconciliation strategy study. Responsible for the public participation process, managing environmental specialists, and compiling a socio-economic overview of the study area.

**Proposed redevelopment of the Blaauwberg Conservation Area: Eerstesteen Node, Western Cape Province, South Africa, City of Cape Town, 2008 - 2010, Environmental Practitioner**

The project entailed an environmental impact assessment (EIA) process for redeveloping the Eerstesteen Conservation Area on the West Coast. Responsible for compiling the EIA report, as well as managing specialists and the public participation process.

**Table Mountain Group aquifer feasibility study and pilot project, Western Cape Province, South Africa, City of Cape Town, 2008 - 2010, Environmental Control Officer**

The City of Cape Town initiated a study into the Table Mountain Group Aquifer as a potential water source to augment the city's supply. The feasibility and pilot project phase record of decision (RoD) required completion for site-specific environmental management plans (EMP's) for drilling sites that were assessed to be environmentally sensitive. Site-specific EMP's were designed for sensitive sites to ensure minimal environmental impact during the drilling phase. Responsible for monitoring compliance with the RoD and EMP during the drilling phase.

**Water reconciliation strategy for the Algoa water supply area, Eastern Cape Province, South Africa, 2008 - 2009, Environmental Practitioner**

This project provided an assessment of the environmental opportunities and constraints for a suite of water schemes in the Algoa water supply area. This was undertaken as part of a broader study in the area.

# Franci Gresse Senior Environmental Impact Assessment Practitioner

**Application for rectification in terms of Section 24G of the National Environmental Management Act (NEMA) for the unlawful commencement of a fruit processing factory on Op de Tradouw Farm, Number 69, Barrydale, Western Cape Province, South Africa, Schoonies Family Trust, 2008 - 2009, Environmental Practitioner**

The project consisted of an application for rectification in terms of Section 24G of NEMA. Responsible for compiling an environmental impact report and an environmental management plan (EMP) for the application, as well as managing the public participation process.

**Proposed development of apple and pear orchards on Soetmelksvlei Farm, Western Cape Province, South Africa, BETCO, 2008 - 2009, Project Staff**

This Agri-development project involved the development of 50 ha of apple and pear orchards in the Riviersonderend region. Responsible for compiling the basic assessment report, environmental management plan (EMP), and managing the specialists and public participation process.

**C.A.P.E. Olifants-Doring Catchment Management Agency project: Development of a catchment management strategy water resource protection sub-strategy for the Olifants-Doring Catchment, South Africa, CapeNature, 2008 - 2009, Environmental Practitioner**

Appointed by CapeNature to compile a catchment management strategy water resource protection sub-strategy for the Olifants-Doorn catchment. Responsible for compiling a database that lists all institutions and their respective mandates in terms of water resource protection and biodiversity conservation decision making for the Olifants-Doring Catchment, workshop arrangements, and general project related work.

**Environmental sensitivity study for the proposed Dasdrif poultry farm in Moorreesburg, Western Cape Province, South Africa, Eikenhoff Poultry Farms (Pty) Ltd, 2008, Project Staff**

The project consisted of an environmental sensitivity study (ESS) which, inter alia, highlighted the potential constraints ('red flags') and opportunities presented by the site from an environmental perspective. Responsible for compiling the ESS.

# Pearl Rakeepile

**Environmental Consultant**

**Qualifications**

BA (Hons) Geography (cum laude)

BA Geography and French

Member, International Association of Impact Assessment South Africa (IAIAsa)

**Specialisation**

Geography and environmental management

**Years in industry**

2,10

Pearl is an environmental consultant in Aurecon's Cape Town office, with a focus on geography and environmental management. Since joining Aurecon she has gained valuable experience in feasibility studies, maintenance management plans, basic assessments and environmental impact assessments, including public participation processes. She has assisted on renewable projects, material supply strategies for gravel roads, power and industrial projects located in South Africa.

She has also had the opportunity to work on an international project for the Rwanda Environment Management Authority to provide technical assistance in environmental and resources management. She is assisting in the compilation of interim reports for the Akagera upstream catchment and the Nyabarongo downstream catchment.

Pearl obtained a Bachelor of Arts (Honours) in Environmental Geography (cum laude) from the University of the Western Cape, South Africa, in 2015 and a Bachelor of Arts in Geography from the University of the Western Cape in 2013. She is a member of the International Association for Impact Assessment South Africa (IAIAsa).

## Experience

**Materials supply strategy for gravel roads, Western Cape Province, South Africa, Provincial Government of the Western Cape (PGWC): Department of Transport and Public Works (DTPW), 02/2015 - 02/2020, Team Member**

Aurecon has been appointed to assist with the material supply and planning, design and control aspects for the maintenance of gravel roads in the Central Karoo and Eden District Municipalities. Services include engineering geology, environmental studies, materials source identification and project management. The contract primarily entails locating and proving suitable material sources for the re-gravelling of 300 km and maintenance activities of 45 000 km of all gravel roads in the two identified district municipalities. Tasks included populating the application forms for borrow pits in the Central Karoo District to apply for the granting of mineral rights in terms of the Minerals and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA). Other duties included replacing Google Earth images in the specialist reports with the recreated JPEGS images, as well as populating the draft basic assessment report for one of the borrow pits.

**Upgrade and refurbishment of the Paarl wastewater treatment works (WWTW), Western Cape Province, Drakenstein Local Municipality, 03/2015 - 03/2019, Team Member**

This project involved a design solution for the upgrade and refurbishment of the Paarl wastewater treatment works (WWTW). The appointment includes the full scope of services, namely planning, design, documentation, procurement as well as contract administration and technical assistance during a 3-5 year operation and maintenance period. Aurecon provided professional engineering services for

the upgrade and refurbishment of the Paarl wastewater treatment works (WWTW) to address hydraulic and process constraints, operational and maintenance shortcomings and improve energy efficiency as well as a new centralised sludge treatment facility incorporating energy recovery which will cater for sludge flows from the Paarl, Wellington and future Paarl South WWTW. Responsible for environmental impact assessment (EIA) applicability checklist.

**Proposed development of two gas to power facilities and associated infrastructure in Saldanha Bay, Western Cape Province, South Africa, SolarReserve South Africa, 02/2016 - 12/2017, Team Member**

The project involves the development of two gas to power facilities and associated infrastructure in the Saldanha Bay Municipality. The two facilities will be located on separate sites in Saldanha Bay and are referred to as “Saldanha 1” and “Saldanha 2”, respectively. Each gas to power facility will be constructed in three phases. Each phase will consist of 1 000 MW combined cycled gas turbines, utilising a dry cooling system or hybrid cooling. Each phase will require approximately 10 ha and will be located adjacent to each other per facility. Responsibilities included the public participation process for the draft scoping report.

**Rwanda Environment Management Authority – technical assistance in environment and natural resources management, Rwanda, Rwanda Environment Management Authority (REMA), 03/2017 - 12/2017, Team Member**

The Government of the Republic of Rwanda has received a credit from the International Development Association (IDA) towards the implementation of the second phase of Lake Victoria Environmental Management Project (LVEMP II). The second phase of Lake Victoria Environmental Management Project will contribute towards the achievement of the East African Community’s Lake Victoria Basin Development vision of having “a prosperous population living in a healthy and sustainably managed environment providing equitable opportunities and benefits”. The project’s development/global environmental objectives are firstly the improvement of the collaborative management of the trans-boundary natural resources of the Lake Victoria Basin (LVB) among the Partner States; and secondly, the improvement of the environmental management of targeted pollution hotspots and selected degraded sub-catchments for the benefits of communities who depend on the natural resources of LVB. Responsible for assisting in the preparation of the interim reports.

**Environmental impact assessment (EIA) for proposed extension of ashing facilities at Kriel Power Station, Mpumalanga Province, South Africa, Eskom, 06/2016 - 11/2017, Team Member**

Aurecon was appointed to undertake an environmental impact assessment (EIA) for the proposed extension of an ash dam facility at the Kriel Power Station. The EIA was postponed after the scoping phase was completed in 2011 due to further geotechnical investigation being required for the preferred site. In 2016, Aurecon's appointment was amended to allow for a new EIA process to be undertaken in terms of the latest environmental legislation. Responsibilities included updating the legislation sections of the environmental impact report, and assisting in the Public Participation Process (PPP).

**Existing housing projects in areas in Cape Town, Western Cape Province, South Africa, City of Cape Town, 05/2015 - 09/2017, Team Member**

The Directorate: Human Settlements of the City of Cape Town (CoCT) appointed Aurecon on a term tender for the provision of professional services for existing housing projects, under contract 275C/2013/14. The city subsequently issued a scope of work to Aurecon to assist it on a consultative process supported by quantitative/rational decision-making to assess the current condition of the asset portfolio and to prioritise critical assets. Responsibilities included site visits to various housing properties managed by the City of Cape Town to assess the building structures by populating and rating a building assessment form, as well as taking photos of the various houses. The task also involved capturing the all collected data.

**Namakwa solar energy development, Northern Cape Province, South Africa, Veld Solar One, 08/2016 - 08/2017, Team Member**

Aurecon was appointed to undertake an environmental impact assessment (EIA) for the development of three solar sites, approximately 20 km north-west of Aggeneys in the Northern Cape Province. The intention is that the solar facilities form part of a consolidated solar development consisting of the proposed Nama Sun 150 MW Concentrated Solar Power (CSP) farm and proposed Veld PV South consisting of a 75 MW PV facility and utilise shared infrastructure where possible to minimise their overall footprint. Each solar site will be assessed as a standalone project so that each could be constructed under its own set of approvals. Responsible for assisting assist in compiling a scoping report (critical biodiversity area write-up, organising maps with GIS team, completing climate and geology baseline section on the draft scoping report, populating environmental assessment application form, as well as compiling stakeholder database and updating the database. Other duties included creating templates for public participation process (PPP), populating scoping appendices, drafting plan of study, editing the scoping report template, obtaining adjacent landowner contact details, splitting the report and populating the PPP folders.

**Environmental Impact Assessment (EIA) for Loeriesfontein Wind Energy Facility (WEF) and transmission lines, Northern Cape Province, South Africa, Business Venture Investments No. 1788 (Pty) Ltd (BVI), 09/2015 - 07/2017, Team Member**

The project involves the proposed construction of three wind energy facilities (WEFs) and associated infrastructure. The WEFs will be constructed in three phases, each of which would have a maximum generation capacity of 140 to 240 MW with a combined generation capacity of approximately 560 to 960 MWs near Loeriesfontein. Aurecon has been appointed to undertake the requisite environmental process as required in terms of the National Environmental Management Act: Act No. 107 of 1998 (NEMA), as amended on behalf of the proponent, Business Venture Investments No. 1788 (Pty) Ltd (BVI). Responsibilities included updating the Public Participation Process (PPP) database by calling the various authorities and land wwners. Also responsible for editing the Public Participation Report (PPR) and the plan of study for environmental impact assessment (EIA). Other duties included updating the scoping report of Kokerboom 1 and 2, as well as responding to the peer review comments on the scoping report for Kokerboom 1 and Kokerboom 2.

**Maintenance management plans (MMP's) for flood damaged road infrastructure, Western Cape Province, South Africa, Western Cape Provincial Government Department of Transport and Public Works, 06/2013 - 06/2017, Team Member**

The project entailed the compilation of maintenance management plans (MMP's) for two local municipal areas (Laingsburg and Worcester), as well as obtaining the necessary permits/ water use authorisations. Responsibilities included populating the water licence application forms and printing the documents.

**Feasibility study for the establishment of a Halal industrial Park in the Western Cape, Western Cape Province, South Africa, Western Cape Government: Department of Economic Development and Tourism (DEDAT), 08/2016 - 06/2017, Team Member**

This project aims to develop an implementable business plan for the establishment of a Halal Industrial Park in the Western Cape. The purpose of the business plan is to provide a basis on which further decisions will be made with regard to the operationalisation of this project. The project consists of two phases - a pre-feasibility phase and a feasibility phase. The output for Phase 1 is an Inception report and the pre-feasibility report of the three sites. Phase 2 will entail a full feasibility on the selected site as approved by the Steering Committee. The outcome of this phase is a draft feasibility report on the identified site and a final feasibility document that will include the bankable business plan. Responsible for assisting in the preparation of the pre-feasibility report (phase 1 and 2); collating project data by conducting interviews with employees from In2food and FPT Group and capturing the collected data.

**Western Cape road materials supply strategy, Western Cape Province, South Africa, Provincial Government of the Western Cape (PGWC): Department of Transport and Public Works, 06/2008 - 04/2017, Team Member**

Increasing pressures from tightened environmental legislation have resulted in lengthy waiting periods for identifying required material sources. The wait is also caused by investigation phases and getting approval from the Mineral Resources and Petroleum Development Act (MR&PDA), the Department of Environmental Affairs and Development Planning (DEADP), the National Environmental Management Act (NEMA) and the Land Use Planning Ordinance (LUPO). Aurecon was appointed for prospecting suitable road making materials, sampling, testing and identifying technically suitable sources to be used for both identified projects and as strategic pits as well as for getting all the required approvals. Tasks included updating land owner information and contacting key authorities for Public Participation Processes (PPP).

**Environmental impact assessment (EIA) for the expansion of approved photovoltaic (PV) facilities near De Aar and Prieska, Northern Cape Province, South Africa, Mulilo Renewable Energies (Pty) Ltd (MRE), 03/2013 - 2017, Team Member**

The project involved an environmental impact assessment (EIA) for the expansion of approved solar energy facilities located on the Hoekplaas and Klipgats Farms in Prieska and the Badenhorst Dam and Du Plessis Dam Farms in De Aar. The expansion of Hoekplaas Farm includes ten additional 75 MW photovoltaic (PV) facilities, while the expansion of Klipgats Pan Farm includes six additional PV units. The expansion of Badenhorst Dam Farm includes four additional 75 MW PV facilities, and that of the Du Plessis Dam Farm includes three additional PV units. Responsibilities included assistance with the Public Participation Process (PPP), as well as drafting a cover letter to notify the Interested and Affected Parties (I&AP) of the termination of the Mulilo PV expansion project.

**Upgrading of Trunk Road 2 between De Beers and Sir Lowry's Pass, Western Cape Province, South Africa, Provincial Government of the Western Cape (PGWC): Department of Transport and Public Works (DTPW), 10/2003 - 12/2016, Team Member**

The project entailed the upgrading of the single carriageway Trunk Road 2, Section 2 (TR2/2) between Broadlands Intersection and the foot of Sir Lowry's Pass to a dual carriageway. Work included the demolition of the existing Sir Lowry's Pass River Bridge deck, converting an abutment into a pier, the construction of a new pier and abutment and the widening of the structure to accommodate two dual carriageways and a sidewalk. Responsibilities included preparing the Final Basic Assessment Report (FBAR) for submission by printing authority letters and compiling an electronic copy to be submitted to the Department of Environmental Affairs and Developmental Planning.

**City of Cape Town: treated effluent infrastructure, Western Cape Province, South Africa, City of Cape Town, 09/2014 - 11/2016, Team Member**

The City of Cape Town is promoting the use of treated effluent for non-potable purposes. Aurecon is involved in the design of a treated effluent reticulation network. Other services provided on this project include project management, site supervision and contract administration. Treated effluent from the Bellville WWTW is currently used for irrigation purposes by existing users. The proposal is to refurbish this pipeline network and expand it to provide approximately 91 km of treated effluent pipelines. This project will supply treated effluent for irrigation purposes to schools, golf courses, parks and sport fields which results in the reduction of potable water used for non-potable purposes. Responsible for environmental impact assessment (EIA) applicability checklist.

**Maintenance management plan (MMP) for the Jakkals River weir, Western Cape Province, South Africa, Fruitways Farming (Pty) Ltd, 01/2016 - 09/2016, Team Member**

The project involved the determination of the applicability of the 2014 environmental impact assessment (EIA) regulations and the compilation of the maintenance management plan (MMP) for the repair of the

existing weir located on the Jakkals River in the Overstrand municipal area. Responsibilities included drafting an environmental impact assessment (EIA) checklist and attending a meeting with the Department of Environmental Affairs and Development Planning for the feasibility of the EIA checklist.

**Nettleton environmental control officer (ECO) - Clifton, Western Cape Province, South Africa, Gossow & Harding Construction, 01/2012 - 04/2016, Team Member**

Aurecon provided Environmental Control Officer (ECO) services required for a home under construction in Nettleton, which is along indigenous vegetation and a stream. Responsible for site visit, environmental management plan and temporary closure compliance checklist.

**Working for Wetlands (WfW) rehabilitation programme: 2014 - 2017, Regional, South Africa, South African National Biodiversity Institute (SANBI), 06/2013 - 12/2015, Team Member**

Aurecon was appointed in 2013 for a three-year cycle for the design, planning, environmental, project and risk management of the South African government's Working for Wetlands (WfW) programme, which is a nationally run initiative by the South African National Biodiversity Institute (SANBI). The programme's objective is to rehabilitate damaged wetlands and to protect wetlands in all nine provinces of South Africa, with an emphasis on complying with the principles of the expanded public works programme (EPWP) through employing only local small, medium and micro enterprises (SMMEs). Responsibilities included assisting with the Public Participation Process (PPP).

# Appendix 2
# Bird Flight Diverters

# APPENDIX 2: BIRD FLIGHT DIVERTERS[1]

**DISTRIBUTION**

**TECHNICAL BULLETIN**

3 April 2009

Enquiries: B P Hill
Tel: (011) 871 2397

**TECHNICAL BULLETIN: 09 TB – 01**
**PART: 4 - MV**

**APPROVED BIRD FLIGHT DIVERTERS TO BE USED ON ESKOMS LINES (MITIGATING DEVICES)**

This Technical Bulletin replaces all other Technical Bulletins that were published previously.

The following two flight diverters (mitigating devices) have been successfully installed and successfully tested on an active line in the Colesberg area.

**1) EBM Flapper**

**Buyers guide number DDT 3053**

The EBM bird flapper tested for the following:

- Pull down test (spirally moving along the conductor) for squirrel and hare conductor
- Testing for radio interference at 27kv on fox conductor
- Testing for corona at 27kv on fox conductor
- Salt fog test for 1000 hours.

The flapper was installed live line on a line in the NW region in conjunction with EWT and proved very successful as a mitigating device.

From field experience and the testing of the flapper it was decided at the Envirotech work group meeting that this EBM flapper can be used on conductors ranging from 6mm to 24mm on ACSR, AAAC conductors and shield wires.

The EBM Flapper can be attached with a link stick and a standard attachment or by hand from a bucket live line or under dead conditions.

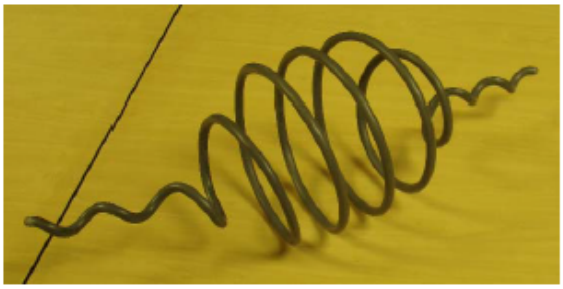
Contact Roger Martin: EBM Tel 011 288 0000

Eskom Distribution

DISTRIBUTION TECHNOLOGY (FAX 011-871-2352)
PRIVATE BAG X1074
GERMISTON 1400

[1] The devices in this appendix are the current (February 2017) recommended devices, but that at the time of construction the most current, Eskom approved devices should be used.

## 2) Tyco Flight Diverter.



**Buyers guide number DDT 3107**

The TYCo flight diverter has been used successfully in many places around the world and has been installed on a line in the NW region in conjunction with EWT and proved very successful as a mitigating device. The device is supplied in colours white and grey.

Contact person: Mr Silas Moloko: TIS Tel 011 635 8000

## 3) Installing Flight Diverters

- Spacing of the bird diverters are to be 5m apart alternating on each phase, for single phase lines the colours would alternate 5m apart on the two lines.
- The flight diverters are to be installed with alternating colours,

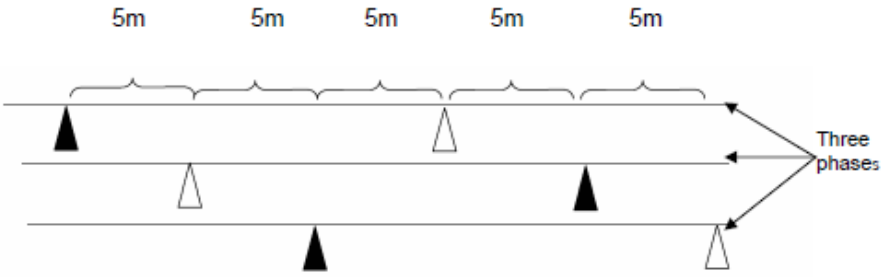



Figure 1

*Signed*

COMPILED BY:

DATE: **April 2009**
**B P Hill**
**Chief Engineer**
**IARC**

*Signed*

APPROVED BY:

DATE: **April 2009**
**Vinod Singh**
**Power Plant Technologies Manager**
**IARC**

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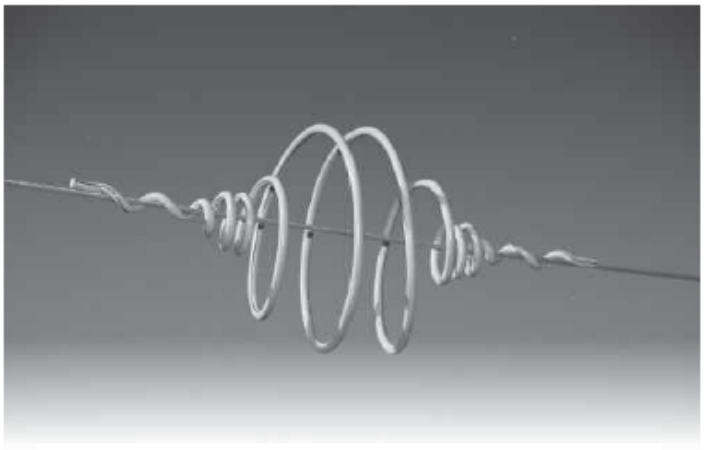
# Double Loop Bird Flight Diverter



## General Recommendation

The Bird Flight Diverter is designed to make overhead lines visible to birds and provides and economic means of reducing the hazard to both lines and birds. For low and medium voltage construction (up to 40kV) it is applied to the phase conductors (bare or jacketed). For high voltage it is used on the earth wire.

The fitting is light in weight, offers little wind resistance and is easily and quickly applied. The positive grip of the fitting on the conductor ensures that it remains in the applied position and cannot move along the span under vibration.

**Visibility:** The diverter section increases the visibility profile of the cable or conductor to a degree necessary to ensure safety, but avoids undesirably bulky outline.

**Spacing:** Spacing distances are not critical and will depend upon local conditions. Since wind resistance is very limited, sufficient fittings can be used to ensure adequate visibility without creating stresses on the line. When marking adjacent spans, overall visibility is improved by staggering the application.

We recommend generally a spacing of 10 or 15 metres.

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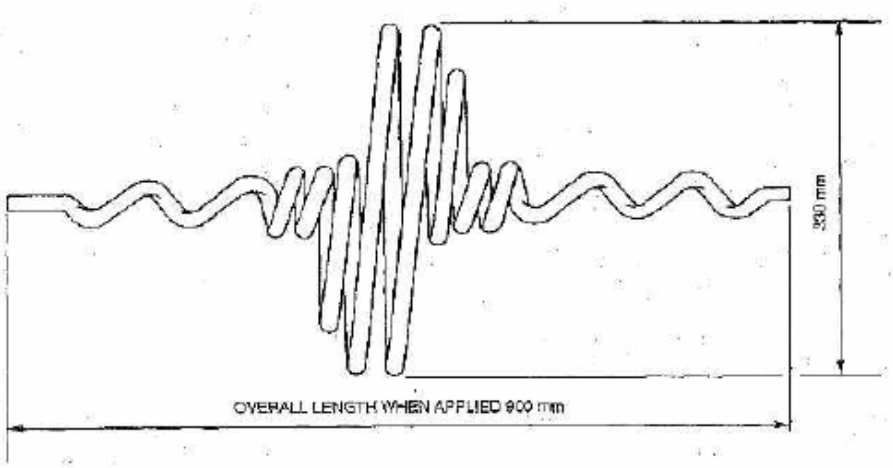
Telephone: 033 387 1520 • Facsimile: 033 387 7094
Email: plppmb@preformedsa.co.za
Website: www.preformedsa.co.za

# Double Loop Bird Flight Diverter




**Material Used:** Manufactured from rigid solid high impact polyvinyl chloride, possessing excellent chemical and strength properties and which will retain good physical characteristics within the range of extreme temperatures. Outdoor aging tests indicate that the material does not deteriorate in function or appearance from the effects of severe weather conditions. Industrial fumes and salt water cannot seriously degrade the properties of rigid PVC.

**Colour:** White or Black

**Lay Direction:** Bird Flight Diverters are supplied right hand lay for both right hand and left hand lay bare conductors and insulated cables.

| CATALOGUE NO. | CONDUCTOR/ E/WIRE DIA. RANGE |
|---|---|
| BFD 0914/LD2* | 9 mm – 14 mm |

*Add B or W to denote colour

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E - 4


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**METHOD STATEMENT**

**CONTRACT:** **DATE:**

**PROPOSED ACTIVITY** (give title of method statement and reference number from specification)

| |
|---|
| |

**WHAT WORK IS TO BE UNDERTAKEN** (give a brief description of the works):

| |
|---|
| |

**WHERE ARE THE WORKS TO BE UNDERTAKEN** (where possible, provided an annotated plan and a full description of the extent of the works):

| |
|---|
| |

**START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:**

| | |
|---|---|
| **START DATE:** | **END DATE:** |

**HOW ARE THE WORKS TO BE UNDERTAKEN** (provide as much detail as possible, including annotated sketches and plans where possible)

| |
|---|
| |

**DECLARATION**

**1) ENVIRONMENTAL CONTROL OFFICER**

The work described in this Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

_____ _____

(Signed) (Print Name)

Dated:

**2) PERSON UNDERTAKING THE WORKS**

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the ECO will audit my compliance with the contents of this Method Statement

_____ _____

(Signed) (Print Name)

Dated:

# Appendix 4
# Example of Environmental Awareness Training

aurecon


## WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe
- Buildings, cars & houses

## WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A contract has been signed
- Disciplinary action (e.g. stop works or fines issued)

## HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP

## WORKING AREAS

- Workers & equipment must stay inside the

## RIVERS & STREAMS

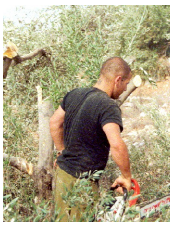
- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in any stream
- Do not work in streams without direct instruction
- Do not damage the banks or vegetation of any stream

## ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site

## TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers



## SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires
- Know the positions of fire fighting equipment
- Report all fires
- Don't burn rubbish/ vegetation

## PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain
- Throw away contents

## DUST

- Try to avoid producing dust
- Use water to make ground & soil wet

## NOISE

- Do not make loud noises around the site, especially near homes
- Report or repair noisy vehicles

## TOILETS


- Use the toilets provided
- Report full or

## EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins

## RUBBISH

- Do not litter – put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly

## TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers - check & report leaks and vehicles that belch smoke
- Ensure loads are secure & do not spill especially when crossing the river

## EMERGENCY PHONE NUMBERS

- Know all the emergency phone numbers:

Ambulance: 10177
Fire: 107/(021) 480 7700
Police: 10111
Disasters: 107
Netcare: 082 911
Environmental: (021) 526 6034

## FINES AND PENALTIES

- Spot fines of between R20 and R2000
- Your company may be fined
- Removal from site
- Construction may be stopped

## PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks & injuries to your supervisor
- Don't make ASSUMPTIONS!
- Ask questions!