



**PROPOSED HAVERFONTEIN WIND ENERGY PROJECT, CAROLINA  
ALBERT LUTHULI LOCAL MUNICIPALITY  
MPUMALANGA PROVINCE OF SOUTH AFRICA**

**ENVIRONMENTAL IMPACT ASSESSMENT  
VOLUME 4: ENVIRONMENTAL MANAGEMENT PROGRAMME**

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## LIST OF ACRONYMS/ABBREVIATIONS

<b>CES:</b>	Coastal and Environmental Services
<b>CITES</b>	Convention on International Trade in Endangered Species
<b>COLTO</b>	Committee of Land Transport Officials
<b>dB</b>	Decibels
<b>DEAET</b>	Department of Economic Affairs, Environment and Tourism
<b>DEAT:</b>	Department of Environmental Affairs and Tourism
<b>DEO</b>	Designated Environmental Officer
<b>DWAF</b>	Department of Water Affairs and Forestry
<b>DWEA:</b>	Department of Water and Environmental Affairs
<b>EAP:</b>	Environmental Assessment Practitioner
<b>ECO:</b>	Environmental Control Officer
<b>EIA:</b>	Environmental Impact Assessment
<b>EIR:</b>	Environmental Impact Report
<b>EMP:</b>	Environmental Management Plan
<b>EMPr:</b>	Environmental Management Programme
<b>EMS</b>	Environmental Management System
<b>ESIA</b>	Environmental and Social Impact Assessment
<b>HIV/AIDS</b>	Human immunodeficiency virus / Acquired Immune Deficiency Syndrome
<b>I&amp;APs:</b>	Interested and Affected Parties
<b>MW:</b>	Mega Watts
<b>NEMA:</b>	National Environmental Management Act 107 of 1998 as amended in 2006
<b>PNCO</b>	Provincial Nature Conservation Ordinance
<b>SAHRA</b>	South African Heritage Resources Agency
<b>SSC:</b>	Species of Special Concern
<b>STD</b>	Sexually Transmitted Disease
<b>WT:</b>	Wind Turbine

# 1 INTRODUCTION

## 1.1 Environmental Management Plans

The Bill of Rights – Chapter 2 of the Constitution Act (Act No. 108 of 1996), includes an environmental right (Section 24) according to which, *“everyone has the right to an environment that is not harmful to their health or well being and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and the sustainable use of natural resources while promoting justifiable economic and social development”*.

In addition, Section 28 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) requires, *“every person causing significant pollution or degradation of the environment, to take reasonable measures to prevent it from occurring, continuing or recurring”*. Therefore, in order to promote effective environmental management throughout the life-cycle of a project, it is important that management actions arising from Environmental Impact Assessments (EIAs) are clearly defined and translated into an Environmental Management Plan (EMP) for the design, construction, operation and/or decommissioning phases of a project.

According to the Western Cape Department of Water and Environmental Affairs and Development Planning (2005), an Environmental Management Plan (EMP) can be defined as, *“an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced”*. The purpose of an EMP is therefore to:-

- Encourage good management practices through planning and commitment to environmental issues;
- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
  - Minimise the extent of environmental impacts and to manage environmental impacts and where possible, to improve the condition of the environment;
  - Prevent long-term or permanent environmental degradation.
  - Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
  - Provide guidance regarding method statements which are required to be implemented to achieve environmental specifications;
  - Define the corrective actions which must be taken in the event of non-compliance with the specifications of the EMP;
  - Describe all monitoring procedures required to identify impacts on the environment, and;
  - Train employees and contractors with regard to environmental obligations.

EMPs are very important tools in the sound environmental management of projects, provided that the specifications are implemented and the user understands the contents of the report, and the reasons for the implementation of certain specifications. As such these various EMP's then form the „backbone” of the overall Environmental Management Programme (EMPr) and associated management and monitoring systems as it is defined by Regulation 33 of GNR 543 of June 2010 (the EIA Regulations - refer to section 1.2 below).

There are essentially four broad categories of EMPs: Design EMP, Construction EMP, Operational EMP and Decommissioning EMP. The objectives of these EMPs are all the same and include; identifying the possible environmental impacts of the proposed activity, and developing measures to minimise, mitigate and manage the negative impacts while enhancing the positive ones. The difference between these EMPs is related to the different mitigation measures required for the different stages of the project lifecycle. Each category of EMP is discussed in more detail below.

**Design EMP:** The Design EMP is an integral component of the project life cycle and requires interaction between the design engineers and environmental consultants to ensure that the engineers are aware of the environmental constraints that they must consider and incorporate these into the final design of the project. The format of the design EMP is that of a checklist in nature, to ensure that all specifications are included in the design phase. The design EMP phase requires ongoing and in-depth discussions between the contractor's final design team and the environmental officer. The engineer will have to cost for and be available for ongoing discussions with the environmental officer at all stages of final design.

**Construction EMP:** The construction phase EMP provides specific environmental guidance for the construction phase of a project where impacts range from those incurred during start-up (e.g. site clearing) to construction activities (e.g. erosion). The Construction EMP consists of both a management system and environmental specifications which contain detailed specifications that need to be undertaken or adhered to by the contractor. Two types of specifications need to be complied with by the contractor namely; standard and specific. Standard specifications apply to all project components and specific specifications outline specific instructions for managing and minimising environmental impacts resulting from the actual activity. The Construction EMP needs to be developed in parallel with the Final Design Stages, and constructive input should be invited from the selected contractor. Sound environmental management is orientated around a pragmatic, unambiguous but enforceable set of guidelines and specifications, and for this reason it is imperative that the contractor, while being bound by the EMP, fully understands it and has had input into its development. Although the contractor tenders on the EMP that has been approved by the relevant authority, it must also be understood that the EMP is a dynamic document that is subject to change.

**Operational EMP:** The operational phase EMP provides specific guidance related to operational activities associated with a particular development. Operational EMPs are sometimes referred to as Environmental Management Systems (EMS).

**Decommissioning EMP:** As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. Examples of potential residual impacts and risks include contamination of soil and groundwater and old (unserviceable) structures. Decommissioning phase EMPs are typically encountered within extractive industries such as minerals mining and oil and gas exploration and extraction. It should be noted that as the proposed wind farm will be operational for at least 20 years, a detailed decommissioning EMP has not been included in this volume but will need to be developed closer to the time of decommissioning.

It is widely recognised that there is no standard format for EMPs. The format needs to fit the circumstances in which the EMP is being developed and the requirements that it is designed to meet (World Bank, 1999; CSIR, 2002; DEAT 2004b). Additionally, the level of detail in an EMP varies depending on the size of the project as well as the magnitude of environmental impacts. Section 1.2 below provides an overview of the information that needs to be included in the EMP based on current South African legislative requirements.

## 1.2 Contents of the EMP

The contents of the EMP must be consistent with the requirements as set out in Regulation 33 of the EIA Regulations published as Government Notice No R. 543 in Government Gazette No 33306 of 18 June 2010 in terms of Chapter 5 of the National Environmental Management Act No 107 of 1998 (NEMA).

According to Regulation 33, an environmental management plan must include –

- a) Details of –
  - (i) the person who prepared the environmental management plan; and

- (ii) the expertise of that person to prepare an environmental management plan;
- b) Information on any proposed management of mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –
  - (i) planning and design;
  - (ii) pre-construction and construction activities;
  - (iii) operation and undertaking of the activity;
  - (iv) rehabilitation of the environment; and
  - (v) closure, where relevant.
- c) A detailed description of the aspects of the activity that are covered by the environmental management plan;
- d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);
- e) Proposed mechanisms for monitoring compliance with the environmental management plan and reporting thereon.
- f) As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;
- g) A description of the manner in which it intends to –
  - i. Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
  - ii. Remedy the cause of pollution or degradation and migration of pollutants;
  - iii. Comply with any applicable provisions of the Act regarding closure, where applicable;
  - iv. Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
- h) Time periods within which the measures contemplated in the environmental management programme must be implemented;
- i) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;
- j) An environmental awareness plan describing the manner in which –
  - i. The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
  - ii. Risks must be dealt with in order to avoid pollution or the degradation of the environment'
- k) Where appropriate, closure plans, including closure objectives.

Provided in the Chapters that follow is the EMP for the proposed Terra Wind Energy Haverfontein Project, based on the requirements of Regulation 33 of the EIA Regulations (GNR 543) as detailed above.

## 2 BACKGROUND INFORMATION

Provided below is a brief description of the proposed project. Should a more detailed project description be required, the reader should refer to Chapter 2 of *Volume 3: Environmental Impact Assessment Report* (CES, November 2011) of the suite of documents for this project.

### 2.1 The Project Proposal

Terra Wind Energy-Haverfontein (Pty) Limited (TWE) - a renewable energy company, plans to develop a wind power generation facility (known as a „wind farm“) on the farm **Haverfontein 7** (Portion 5 (Dawidsdal) (a Portion of Portion 2) of the Farm Haverfontein Nr. 7; The remaining Portion of Portion 2 of the Farm Haverfontein 7, Registration Division I.T.; Portion 4 of the Farm Nooitgedacht Nr 411 Registration Division J.T.; Portion 4 (a portion of Portion 2), Registration Division I.T., all found around Carolina located in the Albert Luthuli Local Municipality (ALLM) in the Mpumalanga Province of South Africa. The proposed project was planned to host up to 33 turbines, each with a nominal power output of between 1.5 and 3 Mega Watts (MW). The total potential output of the wind farm would have been 99MW. Due to specialist study findings, the proposed project is now planned to host up to 25 turbines with a total potential output of 75MW. The wind farm will cover an area of approximately 1,400 hectares (ha).

Coastal & Environmental Services (CES) have been appointed by Terra Wind Energy-Haverfontein (Pty) Limited as Environmental Assessment Practitioner (EAP) to conduct the EIA.

According to Terra Wind Energy Haverfontein (Pty) Ltd, the motivation for the proposed project in general terms arose from the following potential benefits:

- **Electricity supply**

The establishment of the proposed Haverfontein Wind Energy Installation will contribute to strengthening the existing electricity grid for the area and will aid the government in achieving its goal of a 30% share of all new power generation being derived from Independent Power Producers (IPP).

- **Social upliftment**

The need to improve the quality of life for all, but especially the poor, is critical in South Africa. With the expected wind resources in the Carolina area, the proposed project will contribute directly to the upliftment of the individuals and the societies in which they live. Terra Wind Energy-Haverfontein (Pty) Ltd intends to identify community involvement, and projects will be implemented to the fundamental improvement in Carolina and the surrounding areas.

- **Climate change:**

Due to concerns such as climate change, and the ongoing exploitation of non-renewable resources, there is increasing international pressure on countries to increase their share of renewable energy generation. The South African Government has recognised the country's high level of renewable energy potential and has placed targets of 10 000GWh of renewable energy by 2013. In order to kick start the renewable energy sector in South Africa, a Feed-in Tariff for various renewable energy technologies was established. This Feed-in tariff guarantees the price of electricity supply from the renewable energy installation. The resources on this planet are finite and will become more expensive as they get used up. We need coal for many derivative products in our society. As a responsible generation we need to develop technologies which can replace the existing technologies which use the finite fossil fuel resource.

Further, in addition to the above-mentioned benefits, the proposed project site was selected due to:

- Good wind resources suitable for the installation of a large wind energy facility.
- Proximity to connectivity opportunities such as the substation or the High Voltage (HV)

overhead lines traversing the proposed development site. The specific substation that the electrical cables are connected to will be confirmed at a later stage.

- The surrounding area is not densely populated.
- There is potential and appetite within the Albert Luthuli Local Municipality (ALLM) to engage with new technologies and industries.

The proposed Terra Wind Energy Haverfontein project study area and preliminary layout is depicted in Figure 2-1 to 2-4 below.

## Project Description

The wind farm which will be spread over four adjacent property portions encompassing the farm Haverfontein 7. The four land portions are planned to host up to twenty five (25) turbines, each with a nominal power output ranging between 2-3 Mega Watts (MW). The total potential output of the wind farm would be approximately 75 MW, which will serve to further support the regional and national power balance. Provisionally, the 25 turbines have been allocated to the respective property portions as follows:

1. Portion 5 (Dawidsdal)(a portion of Portion 2) of the Farm Haverfontein No 7
2. The remaining Portion of Portion 2 of the Farm Haverfontein 7, Registration Division I.T., Mpumalanga Province
3. Portion 4 of the Farm Nooitgedacht No. 411 Registration Division I.T., Mpumalanga Province
4. Portion 4 (a portion of Portion 2) of the Farm Haverfontein 7, Registration Division I.T., Mpumalanga Province

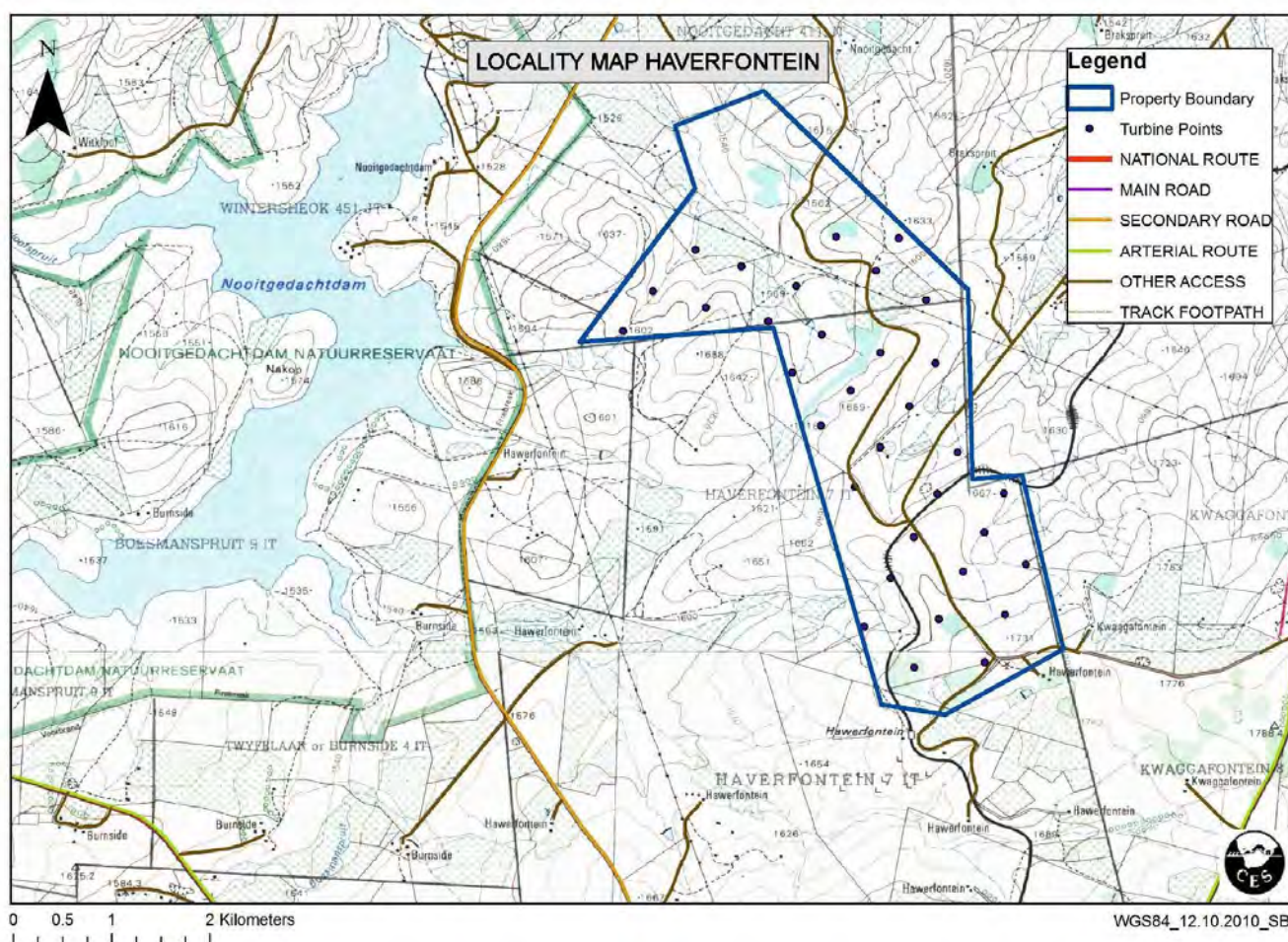
The ultimate size of the wind turbines will depend on further technical assessments but will typically consist of rotor turbines (3 x50m length blades) with rotor diameters of around 113 meters mounted atop a 80 - 100 meter high steel (or hybrid steel/concrete) tower. Other infrastructure components associated with the proposed wind energy facility are *inter alia*:

- Concrete foundations to support the wind turbine towers;
- Approximately 5 meter wide internal access roads to each turbine
- Underground electricity reticulation cables connecting the wind turbines to one another
- Connection 132 kilovolt (KV) overhead power lines traversing the farm.
- Possible upgrading of existing roads for the transportation of the turbines to the Wind Energy Facility.
- One sub-station will be constructed for the Haverfontein Wind Energy Project to receive the generated power.
- Buildings to house the control instrumentation and backup power support. As well as a store room for the maintenance equipment.

Based on Terra Power's experience with developing and constructing wind farms, the implementation of a wind farm of the proposed installed capacity and turbine dimensions would require the following overall construction timeframes and sequencing:

- Preliminary phase = 13 weeks (including 8 weeks to let the foundation concrete dry)
- Wind turbines erection = 4 weeks (in good low wind weather conditions)
- Commissioning and electrical connection = 4 weeks

It is anticipated that these phases will run concurrently on a rolling basis, in order for the Wind Turbines to come online sequentially (approximately every 2 weeks). The overall construction period is expected to be no more than 50 weeks. During the period when the turbines are operational, on-site human activity drops to a minimum, and includes routine maintenance requiring only light vehicles to access the site. Only rare major breakdowns would necessitate the re-deployment of cranes and trucks.



**Figure 2-1: Locality map indicating the revised location of proposed Terra Wind Energy Haverfontein Project**

## 2.2 Brief overview of the Environmental Assessment Process Followed

The International Association for Impact Assessment (1999) defines an Environmental Impact Assessment (EIA) as, *"the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made."* The EIA process in South Africa is guided by regulations made in terms of Chapter 5 of NEMA. The EIA regulations (Government Notice R. 543) set out the procedures and criteria for the submission, processing and consideration of and decisions on applications for the environmental authorisation of activities. Three lists of activities, published on 02 August 2010, as GNR.544 to 546, define the activities that require, respectively, a Basic Assessment (applies to activities with limited environmental impacts or within a prescribed geographical area - province), or a Scoping and Environmental Impact Assessment (applies to activities which are significant in extent and duration).

Because the proposed development triggers a listed activity from GNR.545, it will require a full Scoping and EIA. This process is regulated by Chapter 3, Part 3 of the EIA regulations. The competent authority that must consider and decide on the application for authorisation in respect of the activities as listed in *Volume 3 –EIA* report, is the Department of Environmental Affairs (DEA), formerly the Department of Environmental Affairs and Tourism (DEAT), as the Department has recently reached agreement with all Provinces that all electricity-related projects, including generation, transmission and distribution, are to be submitted to DEA, irrespective of the nature of the applicant. This decision has been made in terms of Section 24(C)(3) of the NEMA (Act No 107 of 1998). The decision is effective for all projects initiated before, and up until, approximately 2015.



Figure 2-2: Areal image indicating the location (orange polygon) of proposed Haverfontein Wind Energy Project in relation to the nearest town, Carolina, Mpumalanga Province

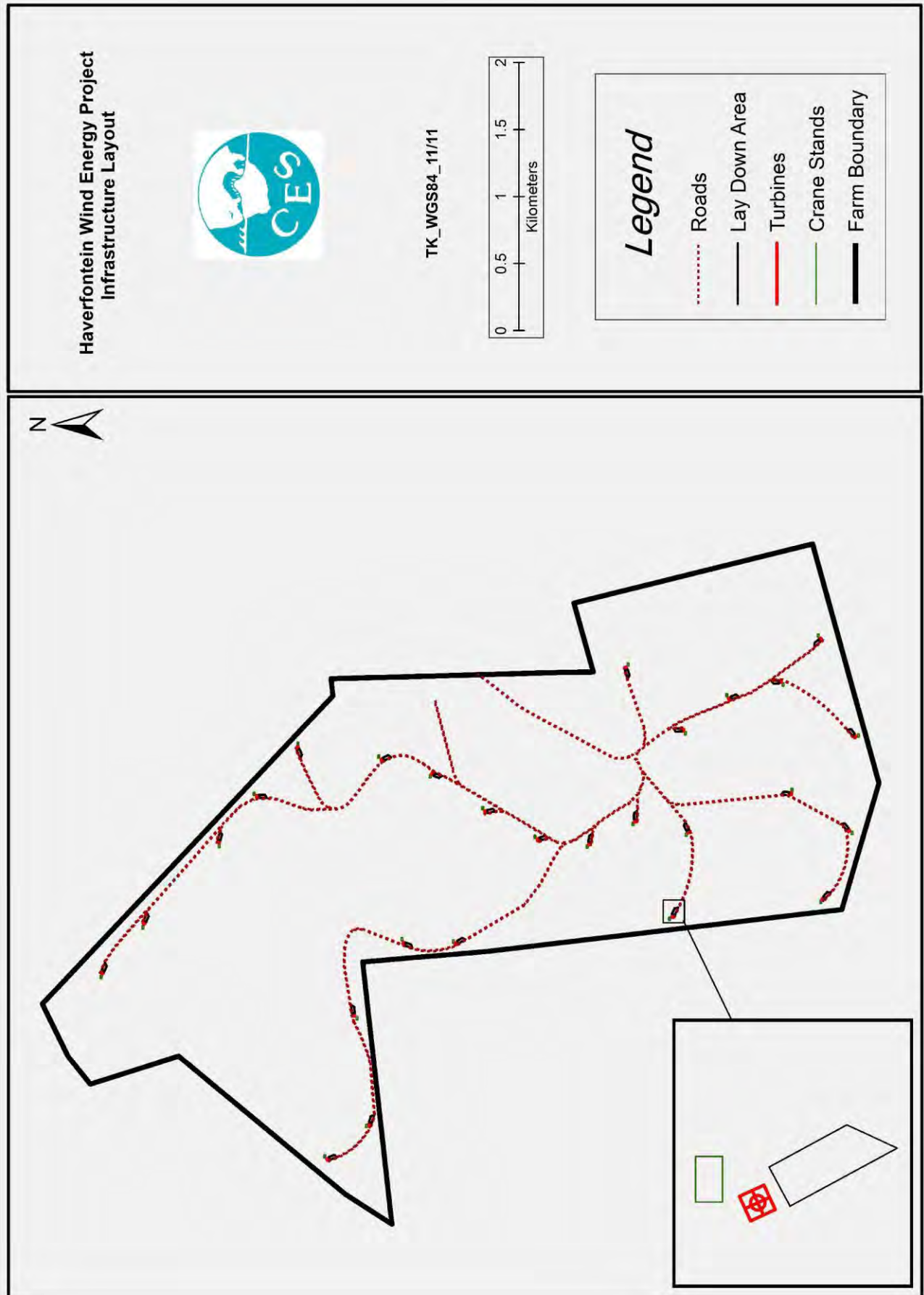


Figure 2-3: Overview of the proposed turbine layout including existing/proposed access roads and cable layout in the project area

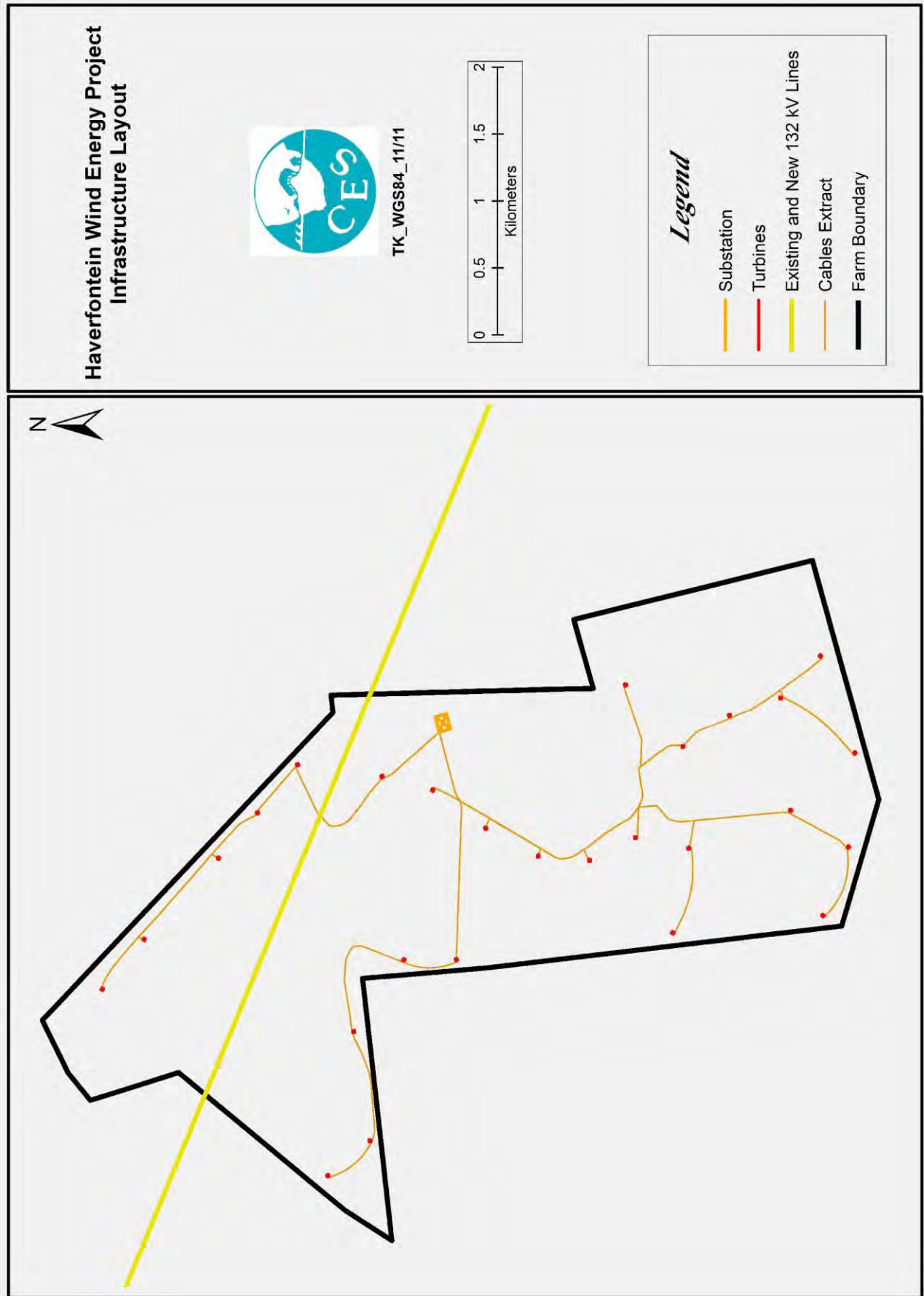


Figure 2-4: Overview of the proposed cabling layout, substation location and point of interconnection (yellow 132kV line traversing the site)

It is important to note that in addition to the requirements for an authorisation in terms of the NEMA, there may be additional legislative requirements which need to be considered prior to commencing with the activity, for example: the National Heritage Resources Act (Act No 25 of 1999), Aviation Act (Act No 74 of 1962) as amended, White Paper on Energy Policy for South Africa (Energy White Paper), White Paper on Renewable Energy Policy (Renewable Energy White Paper), the Integrated Energy Plan for the Republic of South Africa (March, 2003) etc.

In terms of the EIA process, all reports generated from the environmental studies form part of a series of documents for the project. The Environmental Scoping Report (CES, November 2010) identified potentially significant environmental impacts and was the first report in the series. *Volume 3: The Environmental Impact Assessment Report* (CES, February 2011) has investigated potentially significant environmental issues and recommended appropriate mitigation measures.

This Environmental Management Programme (EMPr) interprets the findings of the Scoping Report and EIR, and prescribes project-specific specifications to be achieved. In addition to the requirements of Regulation 33 of GNR 543, this EMP is based on the principles of Integrated Environmental Management (IEM) and is intended to culminate in the adoption of an Environmental Management System (EMS) based on the ISO 14001 international standards.

### 3 EMPR SCOPE AND DEFINITIONS

#### 3.1 Details and Expertise of the Environmental Assessment Practitioner that prepared this EMP

##### 3.1.1 Details of the EAP

**Coastal & Environmental Services** (CES) were commissioned by the applicant, Terra Wind Energy Haverfontein (Pty) Limited to prepare an This Environmental Management Programme (EMPr) that seeks to comply with the EIA regulations. In fulfilment of this requirement, provided below are the details of CES:

Coastal and Environmental Services  
 Physical Address: 67 African Street, Grahamstown, 6139  
 Postal Address: P.O. Box 934, Grahamstown, 6140  
 Telephone: +27 46 6222364  
 Email: info@cesnet.co.za

##### 3.1.2 Expertise of the EAP

CES is a specialist environmental consulting firm. Established in 1990, and with offices in Grahamstown and East London, we primarily specialise in assessing the impacts of development on the natural, social and economic environments. CES' core expertise lies in the fields of strategic environmental assessment, environmental management plans, environmental management systems, ecological/environmental water requirements, environmental risk assessment, environmental auditing and monitoring, integrated coastal zone management, social impact assessment and state of environment reporting. In addition to adhering to all relevant national legislative requirements, which we are often required to review and summarise for specific projects, acquisition of equity funding from the majority of financial institutions demands that developments must meet certain minimum standards that are generally benchmarked against the Policy and Performance Standards of the International Finance Corporation and the World Bank Operational Directives and Policies.

Provided below are short *curriculum vitae* (CVs) of each of the project team members involved in the preparation of the EMPr for the proposed project. Table 3-1 that follows provides the details of the specialists that provided input into this EMPr as per the specialist studies undertaken as part of the EIR Phase.

#### **Mr Marc Hardy**

*(Role: Project Leader and Reviewer)*

Marc holds a M. Phil in Environmental Management from Stellenbosch University's School of Public Management and Planning. His professional interests include environmental impact reporting for linear, energy and bulk infrastructure projects, strategic environmental policy development and reporting – mostly relating to Environmental Management Framework's (EMF's) - compliance monitoring and environmental auditing. Marc has, amongst others, been project manager for the Dinokeng EMF (Gauteng), the Milnerton Refinery to Ankerlig Power Station Liquid Fuels Transportation Infrastructure Project, numerous Eskom Transmission and Distribution power line and substation EIA's countrywide, mining EMPr compliance audits, compliance audits for Camden, Grootvlei and Komati Power Stations and the hazardous waste management facility for the Coega Development Corporation (Coega IDZ). Before entering the consulting field he gained extensive experience in the EIA regulatory field whilst in the employ of the Gauteng Department of Agriculture, Conservation and Environment - being responsible for the review of infrastructure projects like the Gautrain Rapid Rail system and representing the Department on various EMF project steering committees. He is currently managing numerous EIA processes for wind energy developments countrywide, as well as renewable energy and mining projects throughout Africa.

**Mr Hylton Newcombe***(Role: Project Manager and Report Production)*

Hylton holds a BSc degree with majors in general ecology (Zoology), Environmental Science and Ichthyology; and Honours in Ichthyology from Rhodes University and has completed his MSc in Fisheries Science from Rhodes University. His Masters thesis, *The Contribution Towards the Development of a Management Plan for Tuna in South Africa* focused on quantifying and qualifying the size and shape of the tuna sport and baitboat fisheries coupled with biological research in age-growth analysis and genetics for yellowfin tuna *Thunnus albacares*. His interests are focused within a broad range of marine studies, namely biodiversity surveys, jetty EIAs, outfall EIAs, conservation plans and dredging specialist studies.

**Ms Amber Jackson** *(Report Production, Public Participation)*

Ms Amber Jackson, Environmental Consultant, has an MPhil in Environmental Management from the University of Cape Town. Topics covered included environmental management theory, social and ecological systems, climate change and environmental law. With a dissertation in food security that investigated the complex food system of soft vegetables produced in the Philippi Horticultural Area and the soft vegetables purchased at different links, both formal and informal, in the food system. Prior to this she obtained a BSc degree in Zoology and 'Ecology, Conservation and Environment' and a BSc (Hons) in 'Ecology, Conservation and Environment' from the University of the Witwatersrand. Her honours thesis title was: Landscape Effects on the Richness and Abundance of the Herpetofauna in the Kruger National Park.

**Ms Leigh-Ann DeWet** *(Ecological Specialist and Report Production)*

Environmental Consultant/Botanical Specialist. Leigh-Ann holds a BSc (Botany and Entomology) as well as a BSc (Hons) and MSc in Botany from Rhodes University. She conducts vegetation sensitivity assessments, to guide developments and thereby minimising their impacts sensitive vegetation.

In addition, to the above-mentioned EIA team members, provided in Table 3-1 are the details of the specialist consultants that conducted the specialist studies which provided information for inclusion in this Draft EIR. To view short CVs detailing the expertise of each of these specialists to undertake these studies as well as a declaration of their independence to conduct these studies, please refer *Volume 2: Proposed Terra Wind Energy Haverfontein Project: Specialist Reports* (CES, July 2011), for the proposed project.

**Table 3-1: The Specialists involved in the Proposed Terra Wind Energy Haverfontein Project EIA Phase**

Specialist Study	Affiliation	Name of Lead Specialist(s)
Noise	Safetech	Mr Brett Williams
Heritage	National Cultural History Museum, Pretoria	J.A. van Schalkwyk
Avifauna	Endangered Wildlife Trust	Mr Jon Smallie
Visual	MapThis	Mr Henry Holland
Ecological	Coastal and Environmental Services	Prof. Roy Lubke
		Ms. Leigh-Ann De Wet
Bat (Chiroptera)	Animalia Zoological and Ecological Consultation	Mr Werner Marais
Palaeontological	Natura Viva	Dr John Almond
Geotechnical	Aurecon	Mr R M Galliers

### 3.2 Scope of the Haverfontein Wind Energy Project EMPr

The purpose of this EMPr is to ensure “good environmental practice” by taking a holistic approach to the management of environmental impacts during the construction and operation of the proposed Terra Wind Energy Haverfontein Project. This EMPr therefore sets out the methods by which proper environmental controls are to be implemented by the applicant and his nominated contractor based largely on the mitigation measures recommended in the specialist reports and the EIR. However, where necessary, these methods have been expanded upon and additional issues addressed in order to ensure that all environmental aspects are appropriately considered and monitored. The duration over which the contractor’s controls shall be in place cover the construction period of the project as well as the limited time after contract completion defined by the General Conditions of Contract, and the project specifications, as the defects notification period. It is important to note that this EMPr will be focused primarily on the construction and operational phases of the proposed project. Design specifications from an environmental point of view were taken into consideration in the detailed EIR Phase during which, the Environmental Assessment Practitioner (EAP) and Specialist Consultants provided input with regards to possible mitigation measures to reduce environmental impacts.

The provisions of this EMPr are binding on the contractor during construction period. They are to be read in conjunction with all the documents that comprise the suite of documents for this contract (refer to Section 3.3). In the event that any conflict occurs between the terms of this EMP and the project specifications or Environmental Authorisation (formerly termed „Record of Decision’) once/if issued, the terms herein shall be subordinate.

This EMPr has been designed to suite the particular activities and needs of the proposed Terra Wind Energy Haverfontein Project, and incorporates the following:

- General construction mitigation measures;
- Specific project mitigation measures;

The EMPr therefore identifies the following:

- Construction activities that will impact on the environment.
- Operation activities that will impact on the environment.
- Specifications with which the contractor shall comply in order to protect the environment from the identified impacts.
- Actions that shall be taken in the event of non-compliance.

It is important to note that the EMPr is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes shall be submitted to the Contractor, Resident Engineer, Terra Wind Energy Haverfontein (Pty) Limited and relevant environmental authorities in writing for approval. It must be emphasised that some changes may have budget and timeframe implications.

### 3.3 Applicable Documentation

The following environmental documentation is applicable to this project, and should therefore be read in conjunction with this EMP.

- *Proposed Terra Wind Energy Haverfontein Project Volume 1: Final Scoping Report* (CES, February 2011).
- *Proposed Terra Wind Energy Haverfontein Project Volume 2: Specialist Reports* (CES, November 2011).
- *Proposed Terra Wind Energy Haverfontein Project Volume 3: Environmental Impact Assessment Report* (CES, November 2011)

Cognisance of the Environmental Authorisation must be taken once/if it is issued by the Department of Environmental Affairs (DEA) – formerly the Department of Water and Environmental Affairs and Tourism (DEAT). Where necessary, this EMPr must be amended to comply with this Environmental Authorisation, and submitted to DEA for approval.

Other documentation which should be considered includes:-

- All contract documentation applicable.
- All applicable environmental legislation.

### 3.4 Definitions applicable to the environmental aspects of the project

The definitions contained within this document are for explanatory purposes only. In the event that any conflict occurs between the definitions herein and those contained within the final Contract, those within the Contract shall prevail.

**Alien Vegetation:** Alien vegetation is defined as undesirable plant growth which shall include, but not be limited to all declared category 1 and 2 listed invader species as set out in the Conservation of Agricultural Resources Act (CARA) regulations. Other vegetation deemed to be alien shall be those plant species that show the potential to occupy in number, any area within the defined construction area and which are declared to be undesirable.

**Construction Camp:** Construction camp (site camps) refer to all storage and stockpile sites, site offices, container sites, workshops and testing facilities, and other areas required to undertake construction activities.

**Environmental Site Officer (ESO):** An ESO is the site-based designated person responsible for implementing the environmental provisions of the Construction Contract and is appointed by the service provider that carries out construction activities. The ESO shall be the designated responsible person, for implementing any remedial measures as required from time to time and for any authorisations/licences that are required in terms of the service contract. The ESO shall record and communicate environmental issues (as they occur) to the Contractor and maintain records thereof. The ESO shall report concurrently to the contractor and the ECO.

**Environmental Control Officer (ECO):** A suitably qualified and experienced person or entity appointed for the Construction Works, to perform the obligations specified in the environmental authorisation. The ECO's duties shall include inter alia:

- Confirming that all required environmental authorizations and permits, where necessary, have been obtained from the relevant authority(ies);
- Monitoring all activities relating to the project, on a daily basis (or as agreed), for compliance with the provisions of the environmental authorisation, environmental legislation and recommendations of the EMP;
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project

**Environment:** Environment means the surroundings within which humans exist and that could be made up of:-

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

**Environmental Aspect:** An environmental aspect is any component of a contractor's construction activity that is likely to interact with the environment.

**Environmental Authorisation (formerly known as, Record of Decision):** A written statement from the relevant environmental authority, with or without conditions, that records its approval of a planned undertaking to build or upgrade a section of road and the mitigating measures required to prevent or reduce the effects of environmental impacts during the life of a contract.

**Environmental Impact:** An impact or environmental impact is the change to the environment, whether desirable or undesirable, that will result from the effect of a construction activity. An impact may be the direct or indirect consequence of a construction activity.

**Environmental Impact Assessment:** The process of examining the environmental effects of a proposed development. The assessment requires detailed/specialist studies of significant issues that have been identified during the environmental scoping.

**Environmental Management Plan:** 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 projects are enhanced.

**Environmental Management System:** The internationally accepted and recognized environmental management system (EMS) which enables companies, organizations and operations to systematically manage, prevent and reduce environmental problems and associated costs. In terms of ISO 14001 an EMS is defined as, "*that part of the overall management system includes organizational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, reviewing and maintaining the environmental policy.*"

**Environmental Policy:** A statement by the organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

**External Auditor:** A suitably qualified and experienced independent expert as per the required auditor qualifications (ISO 14012).

**Independent Environmental Consultant:** A suitably qualified and experienced independent environmental consultant (IEC) appointed by the Engineer to perform the obligations specified in the Contract. The IEC shall provide reports to the regulatory authority, the Engineer and any other parties as specified by the regulatory authority.

**Interested and Affected Party:** Refers to an interested and affected party contemplated in section 24(4)(d) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and which in terms of that section includes –

- a) *Any person, groups of persons, organization interested in or affected by an activity, and;*
- b) *Any organ of state that may have jurisdiction over any aspect of the activity.*

**ISO 14001 Environmental Management System (ISO 14001):** The internationally accepted and recognised Environmental Management System as reflected in the document SABS ISO 14001: 1996.

**Method Statement:** A written submission by the Contractor in response to the Specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the IEC when requesting the Method Statement, in such detail that the IEC is enabled to assess whether the Contractor's proposal is in accordance with the EMP and associated specifications.

**Mitigate:** The implementation of practical measures to reduce the adverse impacts, or to enhance beneficial impacts of a particular action.

**No-Go Area:** Areas where construction activities are prohibited.

**Pollution:** According to the National Environmental Management Act, No. 107 of 1998, pollution can be defined as, *“Any change in the environment caused by (i) substances; (ii) radioactive or other waves; or (iii) 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 well-being 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”*

**Rehabilitation:** To re-establish or restore to a healthy, sustainable capacity or state.

**Site:** The area in which construction is taking place.

**Species of Special Concern:** Those species listed in the Rare, Indeterminate, or Monitoring categories of the South African Red Data Books, and/or species listed in Globally Near Threatened, Nationally Threatened or Nationally Near Threatened categories (Barnes, 1998).

**Threatened species:** Threatened species are defined as: a) species listed in the Endangered or Vulnerable categories in the revised South African Red Data Books or listed in the Globally Threatened category; b) species of special conservation concern (i.e. taxa described since the relevant South African Red Data Books, or whose conservation status has been highlighted subsequent to 1984); c) species which are included in other international lists; or d) species included in Appendix 1 or 2 of the Convention of International Trade in Endangered Species (CITES).

**Topsoil:** The top 100mm of soil and may include top material e.g. vegetation and leaf litter.

## **4 ENVIRONMENTAL POLICY**

### **4.1 Environmental Policies and Guidelines**

#### **4.1.1 Environmental Policy**

The Contractor is required to compile an environmental management policy, which must consider the following:

- The Contractor’s mission, vision and core values;
- Guiding principles;
- Requirements of, and communication with interested and affected parties (I&APs);
- The need to work towards continual improvement;
- The obligation to prevent pollution and ecological degradation;
- The importance of coordination with other organisational policies (e.g. quality, occupational health and safety, etc.);
- Reference to specific local and/or regional conditions; and
- A commitment to compliance with relevant environmental laws, regulations, by-laws and other criteria to which the Contractor subscribes.

The policy, once approved by Terra Wind Energy Haverfontein (Pty) Ltd, must be communicated to all employees and contractors (and sub-contractors) of the Contractor, and made available to the public, if requested.

#### **4.1.2 Environmental Objectives and Targets**

In order to meet the commitments detailed within the environmental policy, as well as those included within the environmental specifications of this EMPr, the Contractor shall develop environmental objectives and targets. The objectives and targets shall conform to, and comply with, the following criteria:

- The objectives and targets shall constitute the overall goals for environmental performance identified in the environmental policy and strategy.
- When establishing objectives and targets, the Contractor shall take into account the identified environmental aspects and associated environmental impacts, as well as the relevant findings from environmental reviews and/audits.
- The targets must be set to achieve objectives within a specified timeframe.
- Targets should be specific and measurable.
- When the objectives and targets are set, the Contractor must establish measurable Key Performance Indicators (KPIs). These KPIs will be used by the Contractor as the basis for an environmental performance evaluation system and can provide information on both the environmental management and the operational systems. Objectives and targets shall apply broadly across the Contractor’s operations, as well as to site-specific and individual activities.
- Objectives and targets shall be reviewed from time to time in view of changed operational circumstances and/or changes in environmental legal requirements, and shall also take into consideration the views of interested and affected parties (I&APs).

All objectives and targets must be supplied to the Independent Environmental Consultant or ECO for review and use during audits, as would be prescribed in the conditions of the Environmental Authorisation, if the project is approved.

### **4.2 Legislative Framework**

Construction must be according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the

contractor as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The Contractor should note that obligations imposed by the approved EMP are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

#### **4.2.1 Statutory and Other Applicable Legislation and Standards**

The Contractor shall identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act 108 of 1996
- Environment Conservation Act 73 of 1989
- National Environmental Management Act 107 of 1998
- National Environmental Management: Protected Areas Act 57 of 2003
- National Environmental Management: Biodiversity Act 10 of 2004
- National Forests Act 43 of 1983
- National Water Act 36 of 1998
- Conservation of Agricultural Resources Act 43 of 1983
- National Veld and Forest Fire Act 101 of 1998
- Hazardous Substances Act 15 of 1973
- National Heritage Resources Act 25 of 1999
- Atmospheric Pollution Prevention Act 45 of 1965
- National Environmental Management: Air Quality Act 39 of 2004
- National Environmental Management: Waste Management Act 59 of 2008
- Mineral and Petroleum Resources Development Act 28 of 2002
- Health Act 63 of 1977
- Occupational Health and Safety Act 85 of 1993
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity
- All relevant provincial legislation, Municipal by-laws and ordinances.

The following permit requirements would be relevant to the proposed project:

- Permit for the removal of protected plants on the site;
- Approval from the South African Heritage Resources Agency (SAHRA) on cultural issues;
- Hazardous chemicals permit for asphalt plants, if to be used – obtained from the Department of Water and Environmental Affairs (DWEA);
- Health permits for sanitation (Provincial health authorities)
- Fuel storage permit (temporary and permanent) – obtained from DEA;
- Blasting permit – obtained from the Department of Mineral Resources (DMR), if required.

The Contractor shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

#### **4.2.2 IFC performance standards and Equator principles**

All applicable national or international best practice environmental standards will be adhered to. Terra Wind Energy-Haverfontein (Pty) Limited intend to secure project financing from funding institutions that adhere to the Equator Principles, as well as the requirements as set out by the

International Finance Corporation (IFC) Performance Standards. The Equator Principles are a financial industry benchmark for determining, assessing and managing social and environmental risks to projects. There is close alignment between the Equator Principles and the IFC Performance Standards and Sector Guidelines.

Contained in Appendix E is a checklist illustrating how the EIA process has conformed to these requirements, and what aspects remain outstanding or requiring further development in the detailed design phase of the project. This has implications for the content, monitoring and reporting requirements of the final EMPr that will have to be developed prior to construction. Various action plans, policies and manuals will need to be developed by TWE once the final project design is available.

## **5 ADMINISTRATION AND REGULATION OF ENVIRONMENTAL OBLIGATIONS**

### **5.1 Management Structure**

In line with this EMPr, the Contractor must prepare a document clearly outlining and demonstrating the environmental responsibilities, accountability and liability of the Contractor's employees. The Contractor should assign responsibilities for the following:

- Reporting structures.
- Actions to be taken to ensure compliance.
- Overall design, development and implementation of the EMPr.
- Documenting the environmental policy and strategy.
- Implementing the EMPr in all stages/phases of the project.
- All the aspects which require action under the other core elements and sub-elements of the EMPr.

All official communication and reporting lines including instructions, directives and information shall be channelled according to the organisation structure.

### **5.2 Roles and Responsibilities**

#### ***5.2.1 Terra Wind Energy Haverfontein (Pty) Limited***

Terra Wind Energy Haverfontein (Pty) Ltd is the applicant and shall therefore be the entity monitoring the implementation of the EMP and compliance with the authorisation. However, if Terra Wind Energy Haverfontein (Pty) Ltd appoints a Contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf, then the successful contractor's responsibilities are outlined in Section 5.2.2 that follows.

#### ***5.2.2 Contractor***

The successful Contractor shall:

- Be responsible for the finalisation of the EMPr in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the environmental authorisation, if issued by DEA;
- Be responsible for the overall implementation of the EMP in accordance with the requirements of Terra Wind Energy Haverfontein (Pty) Ltd and the environmental authorisation, if issued by DEA;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this EMPr;
- Sign the Pro-Forma: Protection of the Environment (attached as Annexure A).
- Be responsible for obtaining any environmental permits (refer to Section 4.2.1) which are required for the design, construction and operation of the Terra Wind Energy Haverfontein Project.
- Ensure that the appointments of the ECO and ESO are subject to the approval of Terra Wind Energy Haverfontein (Pty) Ltd.

#### ***5.2.3 Environmental Site Officer***

The Contractor shall appoint a nominated representative of the contractor as the Environmental Site Officer (ESO) for the contract.

The ESO will be site-based and shall be the responsible person for implementing the

environmental provisions of the construction contract.

There shall be an approved ESO on the site at all times. It may be necessary to have more than one ESO. The ESO's duties will include, *inter alia*, the following:

- Ensuring that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Reviewing and approving construction method statements with input from the ECO and Engineer, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Keeping accurate and detailed records of all activities on site.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.
- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the ECO and Contractor.

The ESO shall submit regular written reports to the ECO, but not less frequently than once a month.

The ESO must have:

- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- The ESO must be fully conversant with the Environmental Impact Report and Environmental Management Plan for the Terra Wind Energy Haverfontein Project and all relevant environmental legislation.
- The ESO must have received professional training, including training in the skills necessary to be able to amicably and diplomatically deal with the public as outlined in bullet point one above.

The ECO shall be in the position to determine whether or not the ESO has adequately demonstrated his/her capabilities to carry out the tasks at hand and in a professional manner. The ECO shall therefore have the authority to instruct the contractor to replace the ESO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe. The ECO shall visit the development site and in addition to the responsibilities listed in section 5.2.4 below, review the performance of the ESO and submit regular performance reviews to TWE, but not less frequently than once a month.

#### **5.2.4 Environmental Control Officer**

For the purposes of implementing the conditions contained herein, Terra Wind Energy Haverfontein (Pty) Ltd shall appoint an Environmental Control Officer (ECO) for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMP as well as the environmental authorisation are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor and where environmental considerations call for action to be taken. The ECO shall submit regular written reports to Terra Wind Energy Haverfontein (Pty) Ltd, but not less frequently than once a month.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMP and conditions of the environmental authorisation by the Contractor. The ECO's duties in this regard will include, *inter alia*, the following:

- Confirming that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMP, Environmental Authorisation and Contract are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.
- Reviewing and approving construction method statements with input from the ESO and Engineer, where necessary, in order to ensure that the environmental specifications contained within this EMP and environmental authorisation are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMP, Environmental Authorisation and Contract.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel on site.
- Ensuring that activities on site comply with all relevant environmental legislation.
- Ordering the removal of, or issuing spot fines for person/s and/or equipment not complying with the specifications of the EMP and/or environmental authorisation.
- Undertaking a continual internal review of the EMP and submitting any changes to Terra Wind Energy Haverfontein (Pty) Ltd and/or DWEA (in case of major changes) for review and approval.
- Checking the register of complaints kept on site and maintained by the ESO and ensuring that the correct actions are/were taken in response to these complaints.
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to Terra Wind Energy Haverfontein (Pty) Ltd.
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project. The ECO shall also submit compliance audit reports to DEA, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by Terra Wind Energy Haverfontein (Pty) Ltd, prior to submission.
- Keeping a photographic record of progress on site from an environmental perspective. This can be conducted in conjunction with the ESO as the ESO will be the person that will be onsite at all times and can therefore take photographic records weekly. The ECO would need to check and ensure that the ESO understands the task at hand.
- Recommending additional environmental protection measures, should this be necessary.
- Providing report back on any environmental issues at site meetings.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and audits and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools:
  - \* Environmental Impact Assessment.
  - \* Environmental management plans/programmes.
  - \* Environmental auditing.
  - \* Mitigation and optimisation of impacts.
  - \* Monitoring and evaluation of impacts.
  - \* Environmental Management Systems.

The ECO must be fully conversant with the Environmental Impact Assessment, EMP, Environmental Authorisation (if issued) for the Terra Wind Energy Haverfontein Project and all relevant environmental legislation.

TWE shall have the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMP or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

### **5.2.5 Traffic Safety Officer**

The Contractor shall nominate knowledgeable members of staff on site who shall be the responsible persons for the arrangement and maintenance of all traffic accommodation measures required for the duration of the contract. The Traffic Safety Officer shall liaise with the ESO and/or ECO in order to ensure adequate and appropriate traffic arrangements during the transportation of turbine components.

### **5.2.6 Independent External Environmental Auditor**

An independent external environmental auditor shall be appointed by Terra Wind Energy Haverfontein (Pty) Ltd to ensure compliance with the EMPr. The intervals at which environmental audits should be undertaken shall be agreed upon by Terra Wind Energy Haverfontein (Pty) Ltd, the Contractor, the Engineer, DEA and the external auditor. The environmental audit programme should at least include the following:

- A comprehensive environmental audit to be undertaken at the end of the design phase to verify compliance with the EMPr, Environmental Authorisation, Contract, and all applicable environmental legislation.
- Comprehensive environmental audits to be undertaken periodically (at least every two months) during the construction phase, to verify compliance with the EMPr, Environmental Authorisation, Contract Specifications, and all applicable environmental legislation. An audit report should contain recommendations on environmental management activities which are required to be implemented. The external auditor shall report concurrently to the Contractor and Terra Wind Energy Haverfontein (Pty) Ltd.
- A comprehensive environmental audit will be undertaken at the completion of the construction phase for various sections of the wind energy facility, to verify compliance with the EMPr and all applicable environmental legislation. An audit report should contain recommendations on environmental management activities which are required to be implemented within the operation and maintenance phases. The external auditor shall report concurrently to the Contractor and Terra Wind Energy Haverfontein (Pty) Ltd.
- Periodic environmental audits to be undertaken during the operation and maintenance phases in order to verify on-going satisfactory environmental management performance. These audits must be followed up with appropriate remedial and corrective actions should the audit findings demonstrate any non-conformance or non-compliance with the specifications of the EMPr.
- Compile and agree on (together with Terra Wind Energy Haverfontein (Pty) Ltd a template for the ECO and ESO monthly reports essentially meaning that an independent auditor will need to be appointed right at the commencement of the project before construction begins.

### **5.2.7 Liaison Committee**

A liaison committee consisting of a representative from Terra Wind Energy Haverfontein (Pty) Ltd, the Contractor, the Engineer, and any other role-player deemed necessary by the members of the committee (the "Liaison Committee") will meet every month to review the progress of the Contract in implementing and complying with its obligations in terms of this EMPr.

## **5.3 Reporting**

### **5.3.1 Administration**

Before the contractor begins each construction activity, the Contractor shall give to the ECO and

engineer a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the ECO and/or engineer whenever there is a change or variation to the original.

The ECO and/or engineer may provide comment on the methodology and procedures proposed by the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor shall demonstrate at inception and at least once during the contract that the approved measures and procedures function properly.

### **5.3.2 Good Housekeeping**

The contractor shall undertake "good housekeeping" practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

### **5.3.3 Record Keeping**

The engineer and the ECO will continuously monitor the contractor's adherence to the approved impact prevention procedures and the engineer shall issue to the contractor a notice of non-compliance whenever transgressions are observed. The ECO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance shall be documented and reported to the engineer in the monthly report. These reports shall be made available to DEA when requested.

The Contractor shall ensure that an electronic filing system identifying all documentation related to the EMP is established.

A list of reports likely to be generated during all phases of the Terra Wind Energy Haverfontein Project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index:

- Final Environmental Impact Assessment Report.
- Environmental Management Plan.
- Final design documents and diagrams issued to and by the Contractor.
- All communications detailing changes of design/scope that may have environmental implications.
- Daily, weekly and monthly site monitoring reports.
- Complaints register.
- Medical reports.
- Training manual.

- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Copies of all relevant environmental legislation.
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc.
- Crisis communication manual.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- Environmental Authorisation on the EIA from the DEA.
- All method statements from the Contractor for all phases of the project.

#### **5.3.4 Document Control**

The Contractor and resident engineer shall be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document should identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents should be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Contractor shall ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMP are performed. All documents shall be made available to the independent external auditor.

#### **5.4 Environment and Health Training and Awareness**

The ESO and/or ECO must be conversant with all legislation pertaining to the environment applicable to this contract and must be appropriately trained in environmental management and must possess the skills necessary to impart environmental management skills to all personnel involved in the contract.

The contractor shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. The environmental training should, as a minimum, include the following:

- The importance of conformance with all environmental policies.
- The significant environmental impacts, actual or potential, as a result of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures, and with the requirement of TWE's environmental management systems, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures.
- The mitigation measures required to be implemented when carrying out their work activities.
- The importance of not littering.
- The need to use water sparingly.

- Details of, and encouragement to, minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.
- The procedures which should be followed should a grave be encountered, or unearthed during the construction phase.
- Details regarding fauna and flora of special concern, including protected/endangered plant and animal species, and the procedures to be followed should these be encountered during the construction phase.

In the case of permanent staff, the contractor shall provide evidence that such induction courses have been presented. In the case of new staff (including contract labour) the contractor shall inform the engineer when and how he intends concluding his environmental training obligations.

A training needs analysis shall be conducted by the ESO and/or ECO to identify the appropriate environmental and health training programmes, and the appropriate target groups amongst the employees of the Contractor. The results of the environment and health training needs analysis shall be filed with the environmental records and used to set objectives and targets. Recommended Basic Environmental Education Material is provided in Annexure B.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes should contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The Contractor shall ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMP (refer to Sections 5.3.3 and 5.3.4 above). The training records shall verify each of the targeted personnel's training experience. The ECO shall monitor the records and listed and undertake regular follow ups.

## 5.5 Emergency Preparedness

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the life cycle of the project. Such activities may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental veld or forest fires.
- Accidental spillage of hazardous substances.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route that turbine components will need to be transported and for the site itself (e.g. the fire department, spill clean-up services, etc.).

- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

## **5.6 Checking and Corrective Action**

### **5.6.1 Performance Indicators and Targets**

Performance indicators and targets for compliance with the specifications of the EMPr should be agreed upon by TWE, the Engineer and the Contractor, and included within the final EMPr. Consideration should be given to the implementation of incentive bonuses for employees who look after the environment.

### **5.6.2 Non-Compliance**

Non-compliance with the specifications of the EMPr and/or conditions of the environmental authorisation, both of which will be present on-site at all times, constitutes a breach of Contract for which the Contractor may be liable to pay penalties (see Annexure A). The Contractor is deemed not to have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and haul/access roads;
- There is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or
- The Contractor fails to comply with corrective or other instructions issued by the Engineer and/or ECO within a specific time period.

The contractor shall act immediately when a notice of non-compliance is received and correct whatever was the cause for the issuing of the notice. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed therefore any avoidable non-compliance, dependant on severity, shall be reported to TWE for further action, prior to contacting the relevant provincial or national authorities. The engineer's decision with regard to what is considered a violation, its seriousness and the action to be taken against the contractor shall be final. Failure to redress the cause shall be reported to the relevant authority. The responsible provincial or national authorities shall ensure compliance and impose penalties relevant to the transgression as allowed for within its statutory powers.

### **5.6.3 Monitoring**

A monitoring programme will be implemented for the duration of the construction phase of the project. This programme will include:

- Performance Audits: Monthly inspection reports which are performance based compiled by the ECO. This must also incorporate monitoring of compliance issues as well as permits, licenses, the EMPr, Environmental Authorisation, and all contract documentation's conditions. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Compliance Audits: The independent external auditor will initially undertake compliance audits every 2 months. Compilation of an audit report with a rating of the compliance with the EMPr and the environmental authorisation. This report will be submitted to the relevant authorities as and when required.

However, it is important to note that the environmental authorisation will specify the duties of the ECO and the frequency of reporting to DEA.

The following will also assist with monitoring:-

### **Complaints Register**

The Contractor will ensure that a dedicated Complaints Register is kept on site at all times (see Annexure C). The register will contain the details of the person who made the complaint, the nature of the complaint received, the date on which the complaint was made and the response noted with the date and action taken. The Complaints register will be kept in accordance with the requirements of the ECO. This record shall be submitted with the monthly reports and an oral report given at the monthly site meetings.

### **Inspections**

Ongoing visual inspections will be conducted daily by the ESO. The ESO will spend the bulk of his/her time on site on the lookout for any unsafe acts and activities that transgress the requirements as specified in the EMPr. The ESO compiles the site register and the ECO maintains the complaints register and any other records required in the environmental authorisation (the ESO would also have input into this as well, as he/she would be site-based).

### **Spot Fines**

The ECO shall be authorised to impose spot fines for any of the transgressions detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven in excess of designated speed limits.
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere other than using the toilet facilities that have been provided.

These activities, along with the appropriate guidelines to determining the fines shall be agreed to by TWE, the engineer and the Contractor. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the Environmental Specifications and or legal obligations. TWE will inform the Contractor of the contravention and the amount of the fine.

### **Penalty Fines**

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMP, the Contractor shall be liable to pay a penalty fine. The ECO shall recommend to the Contractor the issuing of penalties for contravention of the EMPr, Environmental Authorisation, Contract, or environmental legislation. The following transgressions should be penalised:

- Hazardous chemical/oil spill.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities.
- Violation of environmental authorisation conditions.

These activities, along with the appropriate guidelines to determining fines shall be agreed to by TWE, the Engineer and the Contractor, and will be included within the final EMP. In addition to penalties, the Engineer has the power to remove from site any person who is in contravention of the EMP, and if necessary, the Engineer can suspend part of or all of the works, as required.

### **Internal Audits**

Where the monitoring data and the inspections highlight any problems, an internal audit will be initiated by the ECO. The purpose of the audit is to ascertain the source of the problem and to define what action shall be taken to rectify the problem and prevent its reoccurrence.

### **External Audits**

External audits will be conducted by an independent external auditor appointed by Terra Wind Energy Haverfontein (Pty) Ltd. The external auditor will conduct an in-depth audit so as to ascertain compliance with the EMP as well as the conditions of the environmental authorisation.

### **Incident Reporting and Remedy**

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident (within 24 hours). The following information must be provided:

- The location;
- The nature of the load; and
- The status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences. Annexure D provides an example of an environmental incidents register.

### **Verbal instructions**

Verbal instructions are likely to be the most frequently used form of corrective action and are given in response to transgressions that are evident during routine site inspections by the ESO and/or ECO. Verbal instructions are also used to create further awareness amongst employees as often transgressions are a function of ignorance rather than vindictiveness. Workers must obey verbal instructions through formally recording the actions taken to resolve the matter so that the instruction could be successfully finalised and recorded.

Maximum allowable response time: 2 working days.

### **Written instructions**

Written instructions will be given following an audit. The written instructions will indicate the source or sources of the problems identified on site and propose solutions to those problems. The implementation of solutions will be assessed in a follow-up audit and further written instructions issued if required.

Maximum allowable response time: 4 working days.

### **Public Communication and Liaison with Interested and Affected Parties**

The Contractor shall comply with the requirements for public consultation as required by the Constitution Act, 1996 (Act No 108 of 1996) and the National Environmental Management Act, 1998 (Act No 107 of 1998).

During the construction phase of the project, the Contractor shall be responsible for erecting information boards, in the position, quantity, design and dimensions approved by the Engineer. The information boards shall contain relevant information regarding the construction activity and the relevant contact details to assist persons who wish to submit complaints regarding construction activities.

### **Information distribution**

Copies of the EMP will be made available to I&APs on the Terra Wind Energy Haverfontein (Pty) Ltd website, and at some of the local libraries and the CES website during the EIA process. Copies will also be distributed to all senior contract personnel. All senior personnel on the construction site will be required to familiarize themselves with the contents of the document.

## **5.7 Management Review**

A formal management review needs to be conducted on a regular basis in which the internal audit reports written by the ECO and based on frequent inspections and interactions with the ESO based on the latter's daily reports, audit reports by the independent external auditor will be reviewed. The purpose of the review is to critically examine the effectiveness of the EMPr and its implementation and to decide on potential modifications to the EMPr as and when necessary. The process of management review is in keeping with the principle of continual improvement. Management review will take place when the liaison committee (refer to Section 5.2.7. above) consisting of a representative from TWE, the Contractor, the Engineer, and any other role-player deemed necessary by the members of the committee (the "Liaison Committee") meet every month to review the progress of the Contract in implementing and complying with its obligations in terms of this EMPr for the duration of the project. Where necessary, management review will take place more frequently than every 2 months.

## **6 POTENTIAL ENVIRONMENTAL IMPACTS**

Provided in Tables 6-1a to 6-1c below, is a summary of the potentially significant environmental impacts that may occur in both construction, operational phases and No-Go option as a result of the proposed Terra Wind Energy Haverfontein Project based on the detailed specialist studies undertaken in the EIR Phase. It is important that the Contractor develop Method Statements to minimise potentially significant negative environmental impacts and to enhance positive impacts. Chapter 7 that follows provides the general and specific environmental specifications that must be implemented in order to achieve the above-mentioned objectives. It is also advisable that the reader refers to the EIR and the specialist volume for this project in order to obtain a more exhaustive list of the potential environmental impacts associated with the proposed project, irrespective of their ranking, as these will need to be considered and the mitigation or management measures associated with these impacts, implemented.

**Table 6-1a: Summary of the impacts associated with the proposed Terra Wind Energy Haverfontein Project during the construction phase**

CONSTRUCTION PHASE				
Impact Study	Impact #	Impact type	Significance	
			Without mitigation	With mitigation
Ecological	1	Loss of Grassland	HIGH -	MODERATE -
	2	Loss of plant species of special concern	MODERATE -	MODERATE -
	3	Introduction of alien plant species	MODERATE -	LOW +
	4	Loss of faunal biodiversity	MODERATE -	LOW -
	5	Loss of animal species of special concern	LOW -	N/A
	Cumulative Impact	Effect of fragmenting Vegetation types	LOW -	LOW -
Avifauna	6	Habitat Destruction	MODERATE -	MODERATE -
	7	Disturbance of birds	LOW -	LOW -
Bat	8	Destruction of bat foraging habitat	LOW -	LOW -
	9	Destruction of bat roosts	LOW -	LOW -
Heritage	10	Impact on heritage resources	LOW -	LOW -
Noise	11	Potential Construction Noise Sources (General Equipment and Vehicles)	LOW -	LOW -
Visual	12	Intrusion on views of sensitive visual receptors	HIGH -	HIGH -
	13	Intrusion of large, highly visible wind turbines on the existing views of sensitive visual receptors	HIGH -	HIGH -
	14	Impact of night lights of a wind farm on existing nightscape	LOW (-) TO MODERATE (-)	LOW (-) TO MODERATE (-)

**Table 6-1b: Summary of the impacts associated with the proposed Terra Wind Energy Haverfontein Project during the operational phase**

OPERATION PHASE				
Impact Study	Impact #	Impact type	Significance	
			Without mitigation	With mitigation
Ecological	1	Introduction of alien plant species	HIGH -	LOW +
Avifauna	2	Collision of Birds with Turbines	HIGH -	MODERATE -
	3	Disturbance of Avifauna During Operation	MODERATE -	N/A
	4	Disruption of Local Bird Movement Patterns	MODERATE -	N/A
	5	Collision and Electrocutation of Birds with Power Lines	Negligible	
Bat	6	Bat mortalities during foraging by turbine blades	MODERATE -	LOW -
	7	Bat mortalities during migration by turbine blades	HIGH -	MODERATE -
Heritage	8	Impact on Heritage Resources	MODERATE -	LOW -
Noise	9	Predicted noise levels for the Wind Turbines Generators	LOW -	LOW -
Visual	10	Potential landscape impact	MODERATE -	MODERATE -
	11	Impact of shadow flicker on residents in close proximity to wind turbines	Refer to Text	

**Table 6-1c: Summary of the impacts associated with the proposed Terra Wind Energy Haverfontein Project during the no-go option**

NO-GO				
Phase	Impact Study	Impact #	Impact type	Significance
Construction	Ecological	1	Loss of Grassland	MODERATE -
		2	Loss of plant species of special concern	LOW +
		3	Introduction of alien plant species	HIGH -
		4	Loss of faunal biodiversity	LOW +
		5	Loss of animal species of special concern	HIGH +
		Cumulative Impact	Effect of fragmenting Vegetation types	N/A
	Avifauna	6	Habitat Destruction	N/A
		7	Disturbance of birds	N/A
	Bat	8	Destruction of bat foraging habitat	MODERATE +
		9	Destruction of bat roosts	MODERATE +
	Heritage	10	Impact on heritage resources	MODERATE +
	Noise	11	Potential Construction Noise Sources (General Equipment and Vehicles)	MODERATE +
	Visual	12	Intrusion on views of sensitive visual receptors	N/A
		13	Intrusion of large, highly visible wind turbines on the existing views of sensitive visual receptors	N/A
14		Impact of night lights of a wind farm on existing nightscape	N/A	
Operation	Ecological	1	Introduction of alien plant species	HIGH -
	Avifauna	2	Collision of Birds with Turbines	N/A
		3	Disturbance of Avifauna During Operation	N/A
		4	Disruption of Local Bird Movement Patterns	N/A
		5	Collision and Electrocutation of Birds with Power Lines	N/A
		6	Bat mortalities during foraging by turbine blades	MODERATE +
	Bat	7	Bat mortalities during migration by turbine blades	MODERATE +
		8	Impact on Heritage Resources	MODERATE +
	Noise	9	Predicted noise levels for the Wind Turbines Generators	MODERATE +
	Visual	10	Potential landscape impact	MODERATE -
		11	Impact of shadow flicker on residents in close proximity to wind turbines	Text

## 7 ENVIRONMENTAL SPECIFICATIONS: CONSTRUCTION AND OPERATIONAL PHASES

This Chapter of the EMPr outlines the environmental specifications which are required to be implemented for the construction and operation phases for the Terra Wind Energy Haverfontein Project. The specifications contained here-in are based on the mitigation measures recommended in the Specialist Reports.

It is important to note that in addition to the above, specific environmental specifications for particularly sensitive/specific areas within the proposed development site have also been included in this section (**in boxes**).

Comprehensive environmental audits are to be undertaken periodically during the construction and operation phases, in order to verify compliance with the measures listed below, the recommendations contained within the EIA Report and all applicable environmental legislation. If compliance with any of these measures cannot be met, it will be the responsibility of the Contractor to motivate for this non-compliance.

### 7.1 Site Plan

The contractor shall establish his construction camps, offices, workshops, staff accommodation and testing facilities on the site in a manner that does not adversely affect the environment. However, before construction can begin, the contractor shall submit to the engineer for his approval a site layout plan detailing plans of the exact location, extent and construction details of these facilities and the impact mitigation measures the contractor proposes to put in place. In particular, this plan must include:-

- Site access (including entry and exit points).
- Access and haulage routes.
- All material and equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals) - only designated areas may be used for the storage of materials, machinery, equipment and site offices.
- Construction offices and other structures (accommodation for staff, where required and considered appropriate). The site offices should not be placed in close proximity to steep areas. Preferred locations would be flat areas within the proposed project area. The ecological specialist should be consulted as to the positioning of temporary structures.
- Areas where construction vehicles will be serviced.
- Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff.
- Areas where vegetation will be cleared.
- The locality as well as the layout of the temporary waste storage facilities for litter, kitchen refuse, sewage and workshop-derived effluents. Waste storage facilities for sewage, grey water and workshop-derived effluents, where no formal facilities exist.
- Stormwater control measures.
- Provision of potable water and temporary ablution facilities.
- Potential pollution hazards and mechanisms to manage these.
- Intended mitigation measures regardless of the chosen site for approval by the ECO.

The site plan shall be submitted no later than the first site meeting. Detailed, electronic colour photographs shall be taken of the proposed site before any clearing may commence. These records are to be kept by the engineer for consultation during rehabilitation of the site.

Throughout the period of construction, the Contractor shall restrict all activities to within the designated areas on the approved construction layout plan. Any relaxation or modification of the construction layout plan is to be approved by the ECO.

### **7.1.1 Water for Human Consumption**

Water for human consumption should be available at the site offices and at other convenient locations on site.

### **7.1.2 Heating and Cooking Fuel**

The Contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings. The Contractor shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

### **7.1.3 Sewage Management**

All effluent water from the camp/office sites shall be disposed of or stored in a properly designed and constructed system, situated so as not to adversely affect water sources (streams, rivers, pans dams, etc.). Only domestic type wastewater shall be allowed to enter this drain.

Particular reference in the site establishment plan shall be given to the management of sewage generated at the site offices, and on-site facilities for labour. Sanitary arrangements should be to the satisfaction of the ESO and/or ECO, the local authorities and all applicable legal requirements.

Safe and effective management will require the use of chemical toilets which are supplied and maintained. The type of sewage management will depend on the geology of the local area, the duration of the contract and proximity (availability) of providers of chemical toilets. Chemical toilets will be serviced and emptied on a regular basis and no overflow will be permitted. The positioning of the chemical toilets is to be done in consultation with the ESO and/or ECO. The appropriate permits for sanitation facilities must be obtained from the local authorities.

### **Ablution Facilities**

- The Contractor must provide the necessary ablution facilities for all his employees. These must be easily accessible (within 500m of any point of work), transportable and there should be a minimum of 1 toilet per 15 persons.
- Performing ablutions outside the toilet facilities is strictly prohibited. Use of the veld for this purpose shall not, under any circumstances, be allowed.
- The toilets shall be secured, and provided with an external closing mechanism to prevent toilet paper from being blown out.
- The toilets must be sited more than 50m away from any identified environmentally sensitive areas, drainage lines and water resources.
- Only approved chemical toilets shall be used.
- The Contractor shall arrange for regular emptying of toilets (toilets must be emptied on a daily basis) and will be entirely responsible for enforcing their use and for maintaining these facilities in a clean, orderly and sanitary condition to the satisfaction of the ESO and/or ECO.

## **7.2 Vegetation**

### **Construction Phase**

The following mitigation measures must be implemented to ensure the least possible impact on the local vegetation:

- The Contractor has a responsibility to inform all staff of the need to be vigilant against any practice that will have a harmful effect on vegetation. This information shall form part of the Environmental Education Programme to be effected by the Contractor.

- The natural vegetation encountered on the site is to be conserved and left as intact as possible.
- Keep removal of vegetation to a minimum.
- No construction shall take place in areas of high sensitivity (Bontveld bushclumps as identified in the EIR) i.e. “NO-GO Areas”, except where the EIA Report has indicated that it is acceptable or unavoidable for the development of wind turbines in areas of high sensitivity with the implementation of mitigation measures. All no-go areas must be demarcated with red tape under guidance of the ECO and a professional botanist.
- It is recommended that areas containing species of special concern be noted and every effort made to reduce the impacts of construction on these sections of vegetation.
- Every effort should be made to rehabilitate the damaged vegetation to minimise the habitat losses to resident faunal species.
- Re-vegetation of disturbed areas must be undertaken with site indigenous species and in accordance with the instructions issued by the ECO.
- Areas within the footprint of the development shall be examined prior to any earthworks being carried out to see if there are any endangered plants or SSC which should then be removed by a professional botanist and, where possible, replanted in a suitable area. Prior to removal, however, suitable relocation areas need to be identified, either within the site or in other disturbed areas on the property.
- Some SSC will not transplant. These individuals should, as far as possible, be left untouched.
- Only trees and shrubs directly affected by the works, and such others as may be indicated by the ECO in writing, may be felled or cleared.
- The ECO must undertake a targeted survey of protected trees to identify any individuals of protected species. These must be marked with red tape.
- A permit must be obtained from the Department of Water Affairs (DWA) prior to the removal or damage of any protected tree species.
- Sensitive areas adjacent to the construction area, including all potential habitats for threatened species and areas of Quartzite Fynbos, must be clearly demarcated and no construction activities or impacts must be permitted to occur across these demarcations. Demarcated areas must be fenced off or clearly demarcated with red tape and no personnel or equipment must be permitted to enter these areas.
- The project specification for the rehabilitation of grass cover should be strictly adhered to.
- Any proclaimed weed or alien species that germinates during the contract period shall be cleared by hand before flowering.
- As far as possible, open fires should not be permitted on the construction site. Where required, fires shall only be allowed in facilities or equipment specially constructed for this purpose.
- A firebreak shall be cleared and maintained around the perimeter of the site camp and office site.
- A strict monitoring plan must be implemented to prevent the additional spread and the continued removal of alien species such as those of Pinus and Eucalyptus species, which were already present on site or that become established on areas that were disturbed during construction.

### **Operational Phase**

Management of the development area during the operational phase shall focus on maintaining biodiversity and managing alien invasion. Achieving these objectives will require the preparation of an Alien Eradication Plan, and a Biodiversity Protection Plan. The latter will need to determine, *inter alia*, frequency of burning and/or mowing, areas to be left undisturbed etc.

The following applies with regards to vegetation during the operation phase:

- Continued monitoring of the site for potential alien invasion must take place, especially of plant species that were already on site.

- Maintenance of areas set aside within the site for conservation must take place to ensure that these are not being impacted further in any way.

### 7.3 Rehabilitation

The construction areas and areas where site offices were erected will require rehabilitation at the end of the contract. The area will require ripping and the re-spreading of topsoil to generate vegetation. In this regard, the following rehabilitation strategies apply:-

- Suitable plant species for re-vegetation must be determined early in the re-vegetation programme.
- Depending on the variation in soil types on the micro-scale, it shall be important to differentiate different soil characteristics during rehabilitation from the point of view of separating soil types. The correct soil types must be replaced in the areas from which they were originally removed. This is important as it relates to rehabilitated plants which may only grow in specific soil types. A horticultural specialist shall be brought in to over-see this task.
- Rehabilitation must be scheduled to take place as soon as possible after construction has been completed with acceptable cover being achieved after 3 months.
- Ongoing monitoring and maintenance of rehabilitation works should be undertaken, especially following construction of any roads or digging of trenches for cables.
- All construction material, including concrete slabs are to be removed from the site on completion of the contract.
- An indigenous re-vegetation strategy must be developed and implemented, especially of disturbed areas. This can provide a buffer to protect remaining indigenous vegetation from invasion by weeds and alien invader plants.

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During the re-vegetation / rehabilitation programme, the following applies:

- A botanist/ecologist must be on site to determine if any of the SSC occur where the units and associated infrastructure are positioned.
- Before the clearing of the site is authorised, the appropriate permission must be obtained from the Department of Water Affairs (DWA) for plants listed in the National Forests Act, and from the Provincial Nature Conservation Ordinance (PNCO) Schedule 4 protected species.
- In order to acquire a permit to destroy or remove plant species that fall under the National Forest Act an application form will need to be submitted to DWAF. A letter needs to be drafted and sent to DEA prior to the destruction/removal of any PNCO Schedule 4 species: This letter must list the species that will be removed or destroyed and the reason for their removal or destruction.
- These permits may be subject to certain conditions, for example allowing various nurseries to collect plants before vegetation clearance commences; the removal of certain species for rehabilitation purposes, etc.
- The plants can also be removed and placed in a nursery for use for rehabilitation purposes. If a species is identified for relocation, individuals of the species will need to be located within the proposed site, before vegetation clearing commences, and carefully uprooted and removed by a skilled horticulturist. Prior to removal, however, suitable relocation areas need to be identified, either within the site or in other disturbed areas on the property. Individual plants that cannot be relocated at the time of removal should be moved to the nursery.
- It should be noted that many critical SSC are plants that will not be able to be successfully uprooted and replanted at all, or at best may have a low survival rate. In all cases the species will require very careful treatment to give them the best chances of survival, and specialist horticultural knowledge will be needed.

### 7.4 Fauna

The following measures must be implemented:

- During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible. Only necessary damage may be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place.
- Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas.
- The extent of lay down areas must be minimised and they should not be located in areas that provide habitat for any faunal SSC.
- The Contractor shall ensure that all identified highly sensitive habitats are protected by demarcated no-go areas through fencing or other suitable means.
- The Contractor will establish a relocation plan of action for important flora species within the defined construction area to be taken in conjunction with the conservation authorities to protect or translocate any plant populations encountered during project implementation.
- Buffer zones shall be provided around sensitive habitats.
- If any fencing is to be done; the fences should have enough space between wires for small animals to move across them uninhibited.
- The removal, damage or disturbance of fauna or avifauna will be forbidden in all demarcated no-go areas or specified environmentally sensitive areas.
- The ECO will make the Contractor aware of any Ordinances, Acts, by-laws, or regulations pertaining to the protection of fauna on the site. Where applicable, the Contractor will apply for the necessary permits prior to removing any animals listed in the relevant schedules promulgated in terms of any relevant legislation.
- The trapping of any animal is strictly prohibited. Any animal killed as a result of trapping or hunting or found in the possession of an employee of the Contractor will result in that employee being removed from site for the duration of the Contract.
- No domestic pets or livestock will be permitted on site during the construction period.

#### **7.4.1 Birds and Bats**

Due to the potential fatalities of birds and bats resulting from the proposed project, TWE shall take every precaution in reducing the number of these animals that die as a result of the wind turbines and associated infrastructure.

The following mitigation measures should be used to reduce the number of mortalities:

- Wind turbines should have technology that reduces the amount of noise produced by their machines. This will especially reduce the disturbance to nesting birds.
- Associated infrastructure such as power lines also impact on birds. Where possible cabling and/or power lines should be buried, and not put on poles and run overland. Where this is not possible the power line must be marked with a suitable marking device for collision-prone species.
- Intermittent lighting must be used if possible (i.e. if it does not contradict aviation regulations), as well as red light which is less attractive than white light.
- Appropriate mitigation to reduce the effects of motion smear is that turbine blades either be painted with black stripes across the blade, in different positions on each blade, or a single solid black blade with two solid white blades.
- Monitoring for at least the first two years of operation should take place by an independent specialist. If high bird and /or bat mortalities are recorded then the operator of the wind farm must investigate additional mitigation measures such as emitting broadcasts of a certain radio frequency to discourage birds from entering high collision areas. Similarly, if significant bat mortality is observed then additional mitigation measures must be investigated.

As turbine size does not affect bat fatalities, but turbine height does, there are few mitigation measures that can be implemented to reduce bat fatalities. These are:

- Appropriate mitigation to deter bats from flying into wind turbines is to broadcast ultrasound.

- Wind turbine operating times should be restricted during times when bat activity is high. Bats are at higher risk of fatality on nights with low wind speeds.
- It is recommended that bat fatalities, and their causes at the wind farm are monitored, as there is no information available for wind farms in South Africa. More applicable mitigation measures can be applied when there is more information.

As noted in the Avifauna Specialist Study the following programme is proposed for all phases of the project. This is applicable to bat mortalities and should therefore be implemented with the aim of monitoring both bird and bat mortalities. The monitoring programme is as follows:

- A suitably qualified avifaunal specialist should supervise the monitoring programme, train the necessary observers, collate, analyse, report and publish data.
- This specialist should be contracted by the developer
- The first step for the appointed specialist will be to identify the key information required in the protocol below (highlighted in yellow). This will be best done through a short site visit, which will also serve to train the identified observers and generally iron out any teething problems with the methodologies.
- The bulk of the actual work involved should be done by trained observers, under the guidance and supervision of a qualified and experienced ornithologist. This role could be filled by a number of people or entities, but will need to be the same entity for the duration of the programme.
- The specialist could advise the developer on available options to source observers.

#### **Specific challenges in a southern African context:**

The monitoring protocols that are available from Europe and the USA are mostly aimed at estimating population densities of small passerines in a relatively small study area. In southern Africa, the majority of priority species are large species that are relatively thinly distributed. Specific challenges in a local context are the following:

- Some priority species are sparsely distributed with large territories, e.g. many of the large raptors and cranes. These species could easily be missed during surveys.
- Some priority species are nomadic with fluctuating densities related to habitat conditions, particularly rainfall, e.g. bustards. To cover all possible conditions in the study area would require an effort which will be impractical, both in terms of resources and length of monitoring time.
- Some of the sites are extremely remote and access restricted. This means that sample size will be determined by what is practically possible, introducing bias towards areas within the study area which are accessible, and potentially missing important habitat. This is fortunately not the case at the Haverfontein site.
- Limited availability of suitably experienced individuals that can do monitoring.

The suggested monitoring protocol is an attempt to address the challenges listed above whilst still maintaining a measure of practical realism as to what is possible with limited resources.

#### **Aims of monitoring:**

1. To estimate an abundance index for all the priority species within the wind farm area as a baseline to measure potential **displacement** due to the construction and operation of the wind farm.
2. To estimate the risk of priority species **colliding** with the wind turbines by recording flight behaviour. Recommended method is **vantage point observations**.

**A) Pre-construction monitoring****Displacement due to the construction and operation of the wind farm:****Methodology for calculating an abundance index using line transects:**

- Establish boundaries for the wind farm area (including buffer zones), taking into account the priority species likely to be present, for the area to be surveyed (hereafter referred to as the wind farm area). The experience of the ornithologist will be priority in establishing the buffer zones, the decision to include an area will depend on the priority species that are likely to be present in the wind farm area. It is important that this is done realistically and objectively, taking into account the potential impacts of the wind farm and the availability of resources to conduct the monitoring.
- Identify, delineate and calculate the percentage of each distinct habitat type from a priority species perspective in the wind farm area using a combination of satellite imagery (Google Earth) and GIS tools e.g. agricultural land, ridges, fynbos, woodland.
- Within the study area, selection of transects will largely depend on practical factors e.g. access, but ideally transects should cover as much as possible of the study area, and be as representative as possible of all the habitat types. However, it must be accepted that site variance will be unavoidable given varying capacity, time and access. Standardization of monitoring protocols should however always be attempted across studies, especially in the same regions e.g. the Overberg, West Coast, Karoo etc. in order for results to be extrapolated for comparison purposes, with some degree of confidence.
- Line transects should be counted in summer (from November to March) and in winter (May to August). Transects should be counted at least four times per season. A proposed practical method is for the observer to drive very slowly with a vehicle and stop every 250m and scan the surrounding habitat with binoculars in a 360° radius. All priority species must be recorded. The following data must be recorded:
- Date of count
  - Number of count (each count must be numbered individually)
  - Duration of count i.e. the time it has taken to travel the transect (s)
  - Species
  - Weather conditions
  - Habitat type where the bird is recorded - overflying birds should be noted as such and not linked to a habitat type. In this respect the judgment of the observer will be crucial e.g. a bird that is foraging on the wing in a specific habitat type (e.g. a Black Harrier quartering in fynbos) should be distinguished from a bird that is obviously passing through.
- Ideally a similar exercise should be conducted for a control site of similar habitat composition and size, to make post-construction comparisons meaningful. There may be merit in use of shared control or reference sites for several wind farms in a well-defined geographical area. Control sites should have the following characteristics:
  - Host a similar mix of bird species present on the wind farm development site.
  - Be similar in size to the wind farm area.
  - Be located on ground with a similar mix of habitats and similar topography and aspect.
  - Be as closely matched as possible to the wind farm site, the main difference being the absence of wind turbines from the control.
  - Be situated as close as possible to the wind farm area without its bird populations being so close as to be affected by wind farm operations.
- It is important to record information on priority species occurrence from secondary sources, for example CAR counts or local bird watchers as well. Although this information cannot be analysed as part of the formal protocol, it is nonetheless important, especially if the source is reliable. Typical examples would be if the existence of nesting sites on the property which is known to the landowner. This should be incorporated into the final report.

**Output:**

The main output of the transect monitoring is an abundance index for priority species expressed as species/km for both the wind farm area and the control area. This information will feed into the avifaunal specialist report for the EIA study.

**Collision risk:**

**Methodology for estimating collision risk using vantage point (VP) observations:**

- Vantage point (VP) observations are a means of quantifying flight activity of priority species that take place within the wind farm area, with the principal aim of determining the likely collision risk.
- The purposes of vantage point watches are to collect data on priority species that will enable estimates to be made of:
  - The time spent flying over the defined survey area;
  - The relative use of different parts of the defined survey area;
  - The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height.
  - The flight activity of other species - secondary species using the defined survey area.
- When selecting VPs, the aim should be to cover all of the survey area such that no point is greater than 2km from a VP, but this is not always feasible.
- It is very important that VPs are chosen in order to achieve maximum visibility with the minimum number of points.
- Typically, a site measuring 1000ha will require at least 2 VP's.
- As acuity of observations will decrease with distance, VPs should be located as close to the survey boundary as possible.
- VPs should not be located near to the nest site of target species and observers should try to position themselves inconspicuously so as to minimise their effects on bird movements.
- Coordinates of VPs must be recorded using a GPS. Observers should take care to re-use the exact VP location in successive watches.
- VP observations should be conducted in summer (November to March) and in winter (May to August). A total of 18 hours (two days) of vantage point (VP) observations pre- and post-construction per season per VP should be conducted. VP watches should be conducted in three hour shifts, to account for different levels of bird activity:
  - Shift 1: starting one hour before dawn sunrise?
  - Shift 2: starting noon
  - Shift 3: starting two hours before sunset until visibility becomes too low
- The following data must be recorded at the start of the watch:
  - Watch number
  - Date
  - Start time
  - Wind strength (light, moderate, strong)
  - Wind direction
  - Flight activity for priority species must be recorded in the following manner (number each flying bout consecutively), the use of markers on laminated maps are strongly recommended:
    - Species
    - Flight duration (starting at time of detection until bird disappears from view)
    - Flight height (below the rotor arc; within the rotor arc; above the upper rotor arc - recorded at 15 second intervals until bird disappears from sight)
    - Flight direction recorded at 15 second intervals until bird disappears from sight.
    - Flight mode recorded at 15 second intervals until bird disappears from site (soaring, gliding, flapping)
- Estimation of predicted collision mortality can be undertaken with a model such as that developed by SNH (Scottish Natural Heritage 2000b). Band et al (2007) provide further details, worked examples and discussion. The model leads to an initial estimate of collision risk based on the theoretical assumption that birds take no avoiding action. It is then necessary to build in a more realistic expectation that a high proportion of birds are likely to take avoiding action

successfully (see SNH 2000a). Limited information on avoidance rates is available for some species, based on experience at actual wind farms (see SNH 2004). With time, avoidance rates for SA species will need to be established.

## **B) Post-construction monitoring**

### **Aims:**

- To compare the abundance index for all the priority species within the development area after construction against the pre-construction baseline to measure actual displacement due to the construction and operation of the wind farm. Recommended survey method is line transect counts (see A above).
- To estimate the risk of priority species colliding with the wind turbines by recording actual collisions and comparing post-construction flight patterns with pre-construction baseline data. Recommended methods are carcass searches and VP watches (see A above).

### **Displacement due to the construction and operation of the wind farm:**

*Methodology for calculating abundance conducted in two seasons of years 1, 2, 3, 5, 10 and 15; after the wind farm becomes operational. Bird responses to wind farms may operate over very long periods of time, and that monitoring needs to take this into account, as results from short term observational index using line transects:*

- Methodology has been fully covered under A above.
- Ideally, surveys should be studies are unlikely to be representative.

### **Collision risk**

#### **Methodology for estimating actual collision rates using carcass searches:**

- Carcass searches are the most direct way of estimating the number of collisions and hence the likely impact on species of conservation importance. Measures of the number of collisions can also help to quantify avoidance rates (as used in collision risk modelling calculations), and, when collisions can be ascribed to a particular time, contribute to an understanding of environmental conditions and behaviours that increase collision risk.
- The value of surveying the area for collision victims only holds if some measure of the accuracy of the survey method is developed. To do this, a sample of suitable bird carcasses (of similar size and colour to the priority species – e.g. Egyptian Goose *Alopochenaegyptiaca*, domestic waterfowl and pigeons) should be obtained and distributed randomly around the site without the knowledge of the surveyor, some time before the site is surveyed. This process should be repeated opportunistically (as and when suitable bird carcasses become available) for the first two months of the monitoring period, with the total number of carcasses not less than 20. The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method.
- Simultaneous to this process, the condition and presence of all the carcasses positioned on the site should be monitored throughout the initial two-month period, to determine the rates at which carcasses are scavenged from the area, or decay to the point that they are no longer obvious to the surveyor. This should provide an indication of scavenge rate that should inform subsequent survey work for collision victims, particularly in terms of the frequency of surveys required to maximise survey efficiency and/or the extent to which estimates of collision frequency should be adjusted to account for scavenge rate. Scavenger numbers and activity in the area may vary seasonally so, ideally, scavenge and decomposition rates should be measured twice during the monitoring year, once in winter and once in summer.
- The area within a radius of at least 50 m of each of the turbines (from the outer edge of rotor zone) at the facility should be checked regularly for bird casualties. The frequency of these surveys should be informed by assessments of scavenge and decomposition rates conducted

in the initial stages of the monitoring period (see above), but they should be done at least weekly for the first two months of the study. The area around each turbine, or a larger area encompassing the entire facility, should be divided into quadrants, and each should be carefully and methodically searched for any sign of a bird collision incident (carcasses, dismembered body parts, scattered feathers, injured birds). All suspected collision incidents should be comprehensively documented, detailing the precise location (preferably a GPS reading), date and time at which the evidence was found, and the site of the find should be photographed with all the evidence in situ. All physical evidence should then be collected, bagged and carefully labelled, and refrigerated or frozen to await further examination. If any injured birds are recovered, each should be contained in a suitably-sized cardboard box. The local conservation authority should be notified and requested to transport casualties to the nearest reputable veterinary clinic or wild animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented (as above).

*Methodology for comparing post-construction flight patterns with pre-construction baseline data using Vantage point watches*

In addition to the above monitoring, which will take place largely „on site’, there is a need to do off site counts of Greater Flamingo at the nearby estuaries and salt pans identified by this study. More details on this will be developed by the appointed avifaunal specialist

## **7.5 Waste Management**

The Contractor’s intended methods for waste management and waste minimisation must be implemented at the outset of the contract, and approved by the ECO. All personnel shall be instructed to dispose of all waste in the proper manner.

No waste from construction or otherwise, may be disposed of on site. All waste generated on site, must be removed from the site and disposed of at a licensed waste disposal site. In this regard, adequate litter drums or other suitable containers must be located on site to ensure that waste generated on site is disposed of in suitable and timeous manner.

Where possible, some of the construction waste should be recycled and used in construction.

### **7.5.1 Solid Waste and liquid wastes**

#### **Construction Phase**

Solid waste shall be stored in a designated area within the site area in covered, tip proof drums for collection and disposal. All refuse containers must be free of any holes and in good condition. A refuse control system shall be established for the collection and removal of refuse to the satisfaction of the ESO and/or ECO. As far as possible, general waste (including paper, glass, plastics, aluminium, etc.) shall be sorted for recycling.

Disposal of solid waste shall be at a DEA licensed landfill site, or at a site approved by DEA in the event that an existing operating landfill site is not within reasonable distance from the site. No waste shall be burned. Any water contaminated by cement shall not be allowed to flow freely into the environment. Instead, it must be contained and solids allowed to settle out. Thereafter, the solid material shall be disposed of to a landfill site with other solid waste.

### **7.5.2 Litter**

#### **Construction Phase**

No littering by construction workers must be allowed. During the construction period, the facilities shall be maintained in a neat and tidy condition, and the site is to be kept free of litter. Fines shall

be implemented for persons found littering. Measures shall be taken to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse. At all places of work, the Contractor shall provide litter collection facilities for later safe disposal at DEA approved waste disposal sites.

### **Operational Phase**

During the operation phase, the area of the development should be cleared of litter on a regular basis. Once collected, this litter shall be disposed of at a DEA approved waste disposal site.

#### **7.5.3 Hazardous Waste**

### **Construction Phase**

Hazardous waste such as bitumen, oils, oily rags, paint tins etc. shall be disposed of at a DEA approved hazardous waste landfill site. Special care should be taken to avoid spillage of hazardous waste from entering the ground or contaminating water. In the event of the above occurring, the affected areas shall be promptly reinstated to the satisfaction of the ECO.

As far as possible, maintenance of machinery and vehicles on site should be avoided. Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery should be collected in a holding tank and returned to the supplier. Water and oil should be separated in an oil trap. Oils collected in this manner, should be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit should be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. The Contractor shall ensure that an emergency preparedness plan is in place for implementation in the case of a spill or substances which can be harmful to an individual or the receiving environment.

All used filter materials should be stored in a secure bin for disposal off site. Hazardous waste shall not be stored or stockpiled in any area other than that designated on the construction site layout.

Any contaminated soil should be removed and replaced. Soils contaminated by oils and lubricants should be collected and disposed of at a facility designated by the local authority to accept contaminated materials.

Washing of vehicles on the construction site should not be permitted as this is likely to result in release of hydrocarbon-contaminated wash water into the environment.

### **Operational Phase**

Hazardous materials (if any) which may be generated during the operation phase must be disposed of in a DEA approved hazardous waste landfill site. The Contractor shall ensure that an emergency preparedness plan is in place for implementation in the case of a spill or substances which can be harmful to an individual or the receiving environment.

#### **7.6 Maintenance and Machinery**

The contractor's management and maintenance of his plant and machinery will be strictly monitored according to the criteria given below, regardless whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop).

##### **7.6.1 Safety**

All the necessary handling and safety equipment required for the safe use of petrochemicals and oils shall be provided by the Contractor to, and used or worn by the staff whose duty it is to

manage and maintain the supplier's plant, machinery and equipment.

### **7.6.2 Hazardous Material Storage**

Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials (e.g. oils, lubricants, paints etc) will be stored in a secured, appointed area that is fenced and has restricted entry. Storage of hazardous products shall only take place using suitable containers approved by the ECO.

The Contractor shall provide proof to the Engineer that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials shall be clearly displayed on the storage facility or containment structure. Before containment or storage facilities can be erected, the Contractor shall furnish the Engineer with details of the preventative measures which are proposed to be installed in order to mitigate against pollution of the surrounding environment from leaks or spillage. The proposals shall also indicate the emergency procedures to be implemented in the event of misuse or spillage of substances that will negatively impact on an individual or the environment.

### **7.6.3 Fuel and Gas Storage**

- Fuel shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers.
- Storage of fuel and gas will be confined to the demarcated secure area(s).
- Areas around fuel tanks are to be bunded or contained in an appropriate manner as per the requirements of SABS 089:1999 Part 1.
- Fuel tanks shall be located at least 3.5m from buildings, boundaries and any other combustible or flammable material.
- Leakage of fuel shall be avoided at all times and if found to occur shall be remedied immediately. Suitable and adequate supplies of absorbents shall be available at all times to control and absorb any spillages.
- The Contractor will ensure that an emergency preparedness plan is in place for implementation in case of leakage or spillage of fuel which can be harmful to an individual or the receiving environment.
- An adequate bund wall (110% volume) shall be provided for fuel and diesel areas to accommodate any spillage or overflow of these substances. The area inside the bund wall should be lined with an impervious lining to prevent infiltration of the fuel into the soil.
- Where provision is made for draining water from bunded area, such drains shall be so controlled as to prevent hazardous products from entering natural water courses, public sewers or public drains.
- No storage of any combustible materials (paper, cardboard, wood etc) shall be permitted in any bunded area.
- Generators and fuel supply needed during construction must be placed on trays, which can rest on clean sand.
- Once construction has been completed, this sand must be removed from the site and disposed of at a registered waste site.
- All storage tanks shall be removed after construction.
- Gas welding cylinders and LPG cylinders should be stored in a secure, well-ventilated area which is clearly marked with hazard signs.

### **7.6.4 Fires**

#### **Construction Phase**

- Due to the frequent high winds at the site, no open fires should be permitted on the site.

- Where fires are unavoidable, the Contractor shall ensure the management of fires emanating from construction camps and that education of the work force concerning management of fires is undertaken.
- The Contractor shall ensure that camp fires at construction sites are strictly controlled to ensure that no veld fires are caused. This is especially important where fires may affect sensitive habitats.
- Fires shall only be allowed in facilities or equipment specially constructed for this purpose and these must be located in areas that are sheltered from the prevailing winds.
- A firebreak shall be cleared and maintained around the perimeter of the camp and office sites at all times. The location of this firebreak shall be decided with input from a local botanist and the ECO.

## **7.7 Clearing of the Site**

In all areas where the contractor intends to, or is required to clear the natural vegetation and soil, either within the construction area, or at designated or instructed areas outside the construction area, a plan of action shall first be submitted to the engineer and ECO for approval.

The plan shall contain a photographic record and chainage/land reference of the areas to be disturbed. This shall be submitted to the engineer for his records before any disturbance/stockpiling may occur. The record shall be comprehensive and clear, allowing for easy identification during subsequent inspections.

The contractor shall be responsible for the re-establishment of grass within the development boundaries for all areas disturbed during construction. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated from, construction has to be stored temporarily or otherwise within the construction area, or at designated or instructed areas outside the construction area. This responsibility shall extend until expiry of the defects notification period.

## **7.8 Soil Management**

### **7.8.1 Topsoil**

Topsoil shall be removed from all areas where physical disturbance of the surface would occur and shall be stored and adequately protected. The contract will provide for the stripping and stockpiling of topsoil from the site for later re-use. Topsoil is considered to be the natural soil covering, and to include all organic matter. Depth may vary at each site, and must be determined on a site-specific basis and removed accordingly. The areas to be cleared of topsoil shall include the storage areas and site camps.

All topsoil stockpiles and windrows shall be maintained throughout the contract period in a weed-free condition. Weeds appearing on the stockpiled topsoil shall be removed by hand. The topsoil stockpiles shall be stored, shaped and sited in such a way that they do not interfere with the flow of water such that damming or erosion is caused, or itself be eroded through the action of water. Stockpiles of topsoil shall not exceed a height of 2m, and if they are to be left for longer than 6 months shall be analysed and, if necessary, nutrient levels replenished before replacement.

Soils contaminated by hazardous substances shall be disposed of at a DEA hazardous waste disposal site.

The Contractor shall ensure that minimal amounts of topsoil are lost due to erosion, either by wind or water. This can be facilitated through the grassing of topsoil stockpiles. Areas to be top-soiled and grassed shall be done so systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns.

The Contractor's programme shall clearly show the proposed rate of progress of the application of topsoil and re-vegetation. The Contractor shall be held responsible for the replacement, at his own cost, for any unnecessary loss of topsoil due to his failure to work according to the progress plan approved by the ECO. The Contractor's responsibility shall also extend to the clearing of drainage or water systems that may have been affected by such negligence within and beyond the boundaries of the road reserve.

### **7.8.2 Subsoil**

The subsoil is the layer of soil immediately beneath the topsoil. This layer of soil shall be removed to a depth instructed by the ECO, and stored separately from the topsoil if not used for construction purposes. During rehabilitation, this subsoil shall be replaced in the excavation in the original order it was removed.

## **7.9 Drainage**

- The quality, quantity and flow direction of any surface water runoff shall be established prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities.
- Before a site is developed or expanded, the effect on the drainage pattern as a result of this development or expansion shall be established.
- Recognised water users/receivers must not be adversely affected by the expansion or re-development.
- No water source shall be polluted in any way due to proposed changes.
- Streams, rivers, pans, wetlands, dams, and their catchments shall be protected from erosion, direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products.
- The Contractor shall submit in writing to the Engineer and ECO his proposals for prevention, containment and rehabilitation measures against environmental damage of the identified water and drainage systems that occur on the site. Consideration shall be given to the placement of sedimentation ponds or barriers where the soils are of a dispersive nature, or where toxic fluids are used in the construction process. The sedimentation ponds must be large enough to contain runoff such that they function correctly under heavy rain conditions.
- Measures shall be put in place to protect the hill slopes on site against erosion as a precaution in areas affected by the exposing of unconsolidated soils during construction of the wind energy facility.
- Storage containers must be regularly inspected so as to prevent leaks into the aquatic system.
- Weather forecasts from the South African Weather Bureau of up to three days in advance must be monitored on a daily basis to avoid exposing soil or building works or materials during a storm event and appropriate action must be taken in advance to protect construction works should a storm event be forecasted.

## **7.10 Earthworks and Layerworks**

This section includes all construction activities that involve the excavation of all materials, and their subsequent placement, stockpile, spoil, treatment or batching, for use in the permanent works, or temporary works in the case of deviations. The contractor shall take cognisance of the requirements set out below.

### **7.10.1 Excavation, hauling and placement**

The contractor shall provide the engineer and ECO with detailed plans of his intended construction processes prior to starting any excavations. The plans shall detail the number of personnel and plant to be used and the measures by which the impacts of pollution (noise, dust, litter, fuel, oil, sewage), erosion, vegetation destruction and deformation of landscape will be prevented,

contained and rehabilitated. Particular attention shall also be given to the impact that such activities will have on the adjacent built environment, including nearby houses. The contractor shall demonstrate his “good housekeeping”, particularly with respect to closure at the end of every day so that the site is left in a safe condition from rainfall overnight or over periods when there is no construction activity.

### **7.10.2 Spoil sites**

The contractor shall be responsible for the safe siting, operation, maintenance and closure of any spoil site he uses during the contract period, including the defects notification period. This shall include existing spoil sites that are being re-entered. Before spoil sites may be used, proposals for their locality, intended method of operation, maintenance and rehabilitation shall be given to the engineer and ECO for his approval. The location of these spoil sites shall have signed approval from the affected landowner before submission to the engineer. No spoil site shall be located within 500m of any watercourse. A photographic record shall be kept of all spoil sites for monitoring purposes. This includes before the site is used and after revegetation.

The use of approved spoil sites for the disposal of hazardous or toxic wastes shall be prohibited unless special measures are taken to prevent leaching of the toxins into the surrounding environment. Such special measures shall require the approval of the relevant provincial or national authority. The same shall apply for the disposal of solid waste generated from the various camp establishments. The engineer will assist the contractor in obtaining the necessary approval if requested by the contractor.

Ideally, the storage of excavated material on site should be minimised to avoid unnecessary impacts to the local environment. As soon as practical after excavation, if not simultaneously, all excavated material that is not required for construction or rehabilitation shall be removed from the site for disposal at an appropriate location. This location must be agreed between the developer, engineer and local municipal officials prior to initiation of excavation.

### **7.10.3 Stockpiles**

The contractor shall plan his activities so that excavated materials, in so far as possible, can be transported direct to and placed at the point where it is to be used. However, should temporary stockpiling become necessary, the areas for the stockpiling of excavated and imported material shall be indicated and demarcated on the site plan submitted in writing to the engineer and ECO for their approval, together with the contractor’s proposed measures for prevention, containment and rehabilitation against environmental damage.

The areas chosen shall have no naturally occurring indigenous trees and shrubs present that may be damaged during operations. Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the contractor shall at all times ensure that they are:

- Positioned and sloped to create the least visual impact;
- Constructed and maintained so as to avoid erosion of the material, generation of dust and contamination of surrounding environment; and
- Kept free from all alien/undesirable vegetation.

After the stockpiled material has been removed, the site shall be re-instated to its original condition. No foreign material generated / deposited during construction shall remain on site. Areas affected by stockpiling shall be landscaped, top soiled, grassed and maintained at the contractor’s cost until clearance from the engineer and the relevant National Authority is received. In all cases, the engineer shall approve the areas for stockpiling and disposal of construction rubble before any operation commences and shall approve their clause only when they have been satisfactorily rehabilitated.

#### **7.10.4 Blasting activities**

Wherever blasting activity is required on the site the contractor shall rigorously adhere to the relevant statutes and regulations that control the use of explosives. In addition, the contractor shall, prior to any drilling of holes in preparation for blasting, supply the engineer with a locality plan of the blast site on which shall be shown the zones of influence of the ground and air shock-waves and expected limits of fly-rock. The plan shall show each dwelling, structure and service within the zones of influence and record all details of the dwellings/structures/services including existing positions, lengths and widths of cracks, as well as the condition of doors, windows, roofing, wells, boreholes etc. The contractor, alone, shall be responsible for any costs that can be attributed to blasting activities, including the collection of fly-rock from adjacent lands and fields. The submission of such a plan shall not in any way absolve the contractor from his responsibilities in this regard.

The contractor shall also indicate to the engineer the manner in which he intends to advertise to the adjacent communities and/or road users the times and delays to be expected for each individual blast. The Contractor shall be responsible for obtaining all necessary permits required for blasting activities.

#### **7.10.5 Batching sites**

The project intends to use ready-mix concrete for foundation construction that will be sourced locally. As such, it is not TWE's intention to erect a batching plant on site, however, should this occur the below specifications must be implemented.

Asphalt plants are considered scheduled processes listed in the second schedule to the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965). Should the use of an asphalt plant be considered on site, the contractor shall be responsible to obtain the necessary permit from the DEA, regardless of where they are sited.

Crushing plants and concrete batching plants shall be subject to the requirements of the applicable industrial legislation that governs gas and dust emissions into the atmosphere. Such sites will be the subject of regular inspections by the ECO and relative authorities during the life of the project. The contractor shall provide plans that take into account such additional measures as concrete floors, bunded storage facilities and linings to drainage channels. All sites shall adhere to the following requirements:

- The batching activity shall be located in an area of low environmental sensitivity to be identified and approved by the ECO.
- No batching activities shall occur on unprotected substratum of any kind (i.e. directly on the ground).
- All wastewater and runoff from batching areas shall be strictly controlled, and cement-contaminated water shall be collected, stored and disposed of at a site approved by the ECO. Mixing trays shall be used at all mixing and supply points.
- Contaminated water shall be disposed of at a waste disposal site approved by the ECO.
- Effluent from concrete batch plants and crusher plants should be treated in a suitable designated sedimentation dam to the legally required standards to prevent surface and groundwater pollution. The designs of such a facility should be submitted to the ECO for approval.
- Contaminated water storage facilities shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented.
- Unused cement bags are to be stored so as not to be affected by rain or runoff events.
- Used bags shall be disposed of by the Contractor in the appropriate manner.
- Care shall be taken to collect contaminated wash-water resulting from cleaning activities of equipment and flushing of mixers, and dispose of it in a manner approved by the ECO.

- Suitable screening and containment shall be in place to prevent wind blown contamination associated with bulk cement silos, loading and batching.
- All visible remains of excess concrete shall be physically removed on completion of the plaster or concrete pour section and disposed of. All excess aggregate shall also be removed.

Ultimate approval of these measures shall be from the relevant national authority, as shall approval of closure. The engineer will assist the contractor in his submissions to the relevant authority. The contractor shall invite the relevant department to inspect the site within 2 months after any plant is commissioned and at regular intervals thereafter.

## **7.11 Spillages**

### **Construction Phase**

Streams, rivers and dams shall be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and tar or bituminous products. In the event of a spillage, the contractor shall be liable to arrange for professional service providers to clear the affected area.

Responsibility for spill treatment lies with the contractor. The individual responsible for, or who discovers a hazardous waste spill must report the incident to his/her ESO, ECO or to the engineer. The ESO will assess the situation in consultation with the engineer and act as required. In all cases, the immediate response shall be to contain the spill. The exact treatment of polluted soil / water shall be determined by the contractor in consultation with the ESO, ECO and the engineer. Areas cleared of hazardous waste shall be re-vegetated according to the engineer's instructions

Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input shall be agreed with the engineer. The costs of containment and rehabilitation shall be for the contractor's account, including the costs of specialist input.

### **Operational Phase**

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental environment-related incidents throughout the life cycle of the project. These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route that the turbine components will need to be transported as well as for the site itself (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident management plans for the site.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each and measures to be taken in the event of accidental release.
- Training plans and testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act,

1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

## **7.12 Areas of Specific Importance**

Any area, as determined and identified within the project document as sensitive or of special interest within the site shall be treated according to the express instructions contained in these specifications or the approved EMP. The contractor may offer alternative solutions to the engineer in writing should he consider that construction will be affected in any way by the hindrance of the designated sensitive area or feature. However, the overriding principle is that such defined areas requiring protection shall not be changed. Every effort to identify such areas within the site will have been made prior to the project going out to tender. The discovery of other sites with archaeological or historical interest that have not been identified shall require *ad hoc* treatment.

### **7.12.1 Archaeological, heritage or palaeontological sites**

In terms of heritage impacts, several archaeological sites exist in the shelters below the top of the hills on which the turbines for the project will be placed (within a 1km radius). The sites all occur along the slopes of the affected hills and will not be affected by the proposed project. Although the turbines will not affect these sites, it must be noted that servitudes must be placed in such a manner that they do not impede on these sites.

If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the engineer of such discovery. The South African Heritage Resources Agency (SAHRA) shall be contacted and they will appoint an archaeological consultant to record the site and excavate if necessary. Work may only resume once clearance is given in writing by the archaeologist.

### **7.12.2 Fossil sites**

Specialist palaeontological mitigation for this project is not recommended unless:

- Wind turbines or ancillary developments are sited over the Sundays River Formation (mainly escarpment areas); or
- Deep excavations penetrate through the limestone capping into Sundays River sediments below.

In these two cases, mitigation by a professional palaeontologist is recommended during the construction phase of the wind farm and should entail:

- The field examination of new bedrock excavations;
- the recording of sedimentological and palaeontological data; and
- the judicious sampling of fossil material and
- recommendations for any further action required to safeguard fossil heritage.

It is important that the opportunity to mitigate is given while the bedrock excavations are fresh and before they are infilled, covered over or degraded by weathering and plant growth. Before development starts a realistic programme of mitigation should therefore be negotiated between the developer and the palaeontologist contracted for the project to maximize the scientific and conservation benefits of the work while minimizing disruption of the construction programme.

The palaeontologist involved will need to obtain a fossil collection permit from SAHRA and make arrangements with an approved repository (e.g. museum, university) to store and curate any fossil material collected.

### **7.12.3 Graves and middens**

If a grave or midden is uncovered on site, or discovered before the commencement of work, then all work in the immediate vicinity of the graves/middens shall be stopped and the engineer informed of the discovery. The National Monuments Council should be contacted and in the case of graves, arrangements made for an undertaker to carry out exhumation and reburial. The undertaker will, together with the National Monuments Council, be responsible for attempts to contact family of the deceased and for the site where the exhumed remains can be re-interred.

### **7.13 Noise Control**

#### **Construction Phase**

- Construction will be restricted to normal daytime working hours (08:00 – 17:00). No construction activities will take place during weekday evenings and night-time (after 17:00), on Saturdays after midday (12:00) and the entire day on Sundays.
- No construction piling should occur at night. Piling should only occur during the hottest part of the day to take advantage of unstable atmospheric conditions.
- All noise-making equipment shall be turned off when not in use.
- All equipment shall be kept in good working order.
- All equipment shall be operated within specifications and capacity (i.e. do not overload machines).
- Compliance with the appropriate legislation with respect to noise is mandatory.
- The Contractor will familiarise himself with, and adhere to, any local bylaws and regulations regarding the generation of noise.
- Construction staff should be given “noise sensitivity” training.
- The Contractor will endeavour to keep noise generating activities associated with construction activities to a minimum.
- Modern low noise emission vehicles and equipment shall be favoured on site. The details of all construction machinery and vehicles must be determined prior to construction in order to identify potentially noisy machinery and to seek possible alternatives. These details will include the manufacturer, type and noise emission data of each machinery/vehicle and how many will be used at any time. Note that manufacturers of modern vehicles and machinery provided for the international market are obliged to provide noise emission data. Where this information is not available, noise measurements must be conducted prior to use of such machinery or vehicles.
- A well planned and co-ordinated “fast track” procedure is implemented to complete the total construction process in the area in the shortest possible time.
- The size of explosive charges used for blasting (if required) should be optimised so as to balance breaking capacity against minimising any vibration impact and fly-rock.

#### **Operational Phase**

During operation of the wind energy facility, Terra Wind Energy Haverfontein (Pty) Ltd shall ensure that the turbine infrastructure is maintained such that noise levels in identified noise sensitive areas associated with the Terra Wind Energy Haverfontein Project do not exceed the legally acceptable level of 45 dB for affected communities or households. A noise monitoring programme should be developed and implemented for at least the first two years of operation.

### **7.14 Dust Control**

- Appropriate dust-suppression techniques as approved by the Engineer and ECO shall be implemented on all exposed surfaces during periods of high wind. Such measures shall include; wet suppression, chemical stabilisation, use of wind fence covering surfaces with straw or chippings, and the re-vegetation of open areas.

- Water used for dust suppression must be applied in quantities small enough not to generate run-off and result in soil erosion.
- Mitigation actions such as the reduction of vehicle speed and proper signage shall also be implemented.
- Blasting must be restricted to periods of calm wind conditions to minimise the potential for dust dispersion.
- Vegetation cover should be maintained and vegetation cover only removed until such time as soil stripping is required.
- Exposed soil that has the potential for generating dust shall be re-vegetated or stabilised as soon as possible after construction work is completed, or kept damp until re-vegetation occurs.
- Excavation, handling and transport of topsoil and spoil shall be avoided during periods of excessive wind.
- Adequate water carts shall be available on site to meet demands throughout the duration of the contract.
- The Contractor shall ensure that loose building materials and excavated material stockpiles are adequately protected against the wind by a covering of some description, such as canvas.
- Stockpiles may also be dampened to minimise dust generation.
- Construction vehicles and machinery will be serviced on a monthly basis, with a major service every six months.
- Construction vehicles and machinery shall be inspected for excessive emissions.

## 7.15 Control and Management of Alien Vegetation

### Construction Phase

- Mitigation measures to reduce the impact of the introduction of alien invaders, as well as mitigation against alien invaders that have already been recorded on the site should be actively maintained throughout both the construction and operation phases.
- The Contractor shall be held responsible for the removal of alien vegetation within the development area disturbed for the duration of the construction phase. This includes, for example, access roads, stockpile areas, and wherever material generated for or from construction has been stored temporarily or otherwise within the development area.
- Any proclaimed weed or alien species that germinates during the contract period shall be cleared by hand before flowering.
- Removal of existing alien species shall be consistently done
- Alien plants must be removed as soon as they are detected.
- Removed alien vegetation must be burned in an appropriate location (to be approved by the ECO), or should be disposed of in accordance with the appropriate methods developed by the Working for Water Programme, and advice from this organisation shall be obtained.
- A pest control operator registered for the industrial application of herbicides shall apply herbicides, or shall supervise the application of herbicides in compliance with the terms of the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947). The use of herbicides shall not be permitted within identified sensitive areas. Removal of alien vegetation within these areas must be undertaken by hand.
- Re-vegetation of disturbed areas must be undertaken with site indigenous species.
- The Contractor shall avoid translocating stockpiles of topsoil from one place to another in order to avoid translocating soil seed banks of alien species.
- Depending on the variation in soil types on the micro-scale, it shall be important to differentiate different soil characteristics during rehabilitation from the point of view of separating soil types. The correct soil types must be replaced in the areas from which they were originally removed. This is important as it relates to rehabilitated plants which may only grow in specific soil types. A horticultural specialist shall be brought in to over-see this task.
- A strict monitoring plan must be implemented to prevent the additional spread and the continued removal of alien species such as those of *Acacia mearnsii*, Black wattle.

## **Operational Phase**

- The Contractor shall be held responsible for the removal of alien vegetation within the boundaries of the wind energy facility disturbed during construction in accordance with the appropriate methods developed by the Working for Water Programme, and advice from this organisation shall be obtained. This responsibility shall extend for the duration of the defects liability period.
- During operation, the clearing of alien plants within the area is required to control alien invasions. This is mandatory, according to current legislation.

### **7.16 Erosion Control Measures**

The following areas should also be regarded as being of high erosion risk:

- Slopes > 20°.
- Slopes with convergent sub-surface drainage (percolines).
- Road culverts.
- Cut and fill slopes in areas of slope instability or erodable geology.

The above areas, particularly steep cut and fill slopes in soft or erodable material, will require appropriate erosion control measures (e.g. use of gabions) and appropriate re-vegetation methods as listed below.

## **Construction Phase**

- The removal of the natural vegetation cover must be avoided and where this cannot be done, minimised.
- Agricultural drainage methods must be used in fill materials to remove water that could trigger slumping.
- Perched water tables must be identified early and adequate drainage for these trigger-points provided.
- The disturbance of the natural soil structure must be prevented and excavations planned carefully.
- The moving of heavy machinery into areas unnecessarily must be avoided.
- All fill material must be very well compacted and innovative use of geo-textile materials in the retention of soil fill areas made.
- Rainwater runoff from cut slopes must be prevented as far as possible.
- Sufficient storm water take off points must be created in such a way that water does not have an opportunity to gather momentum.
- Storm water ditches must contain structures that will reduce velocity of the run off.
- The use of vegetated swales must be investigated in less steep areas.
- Particular care must also be taken to ensure that no existing infrastructure such as water and sewerage reticulation lines is damaged during construction activities.
- Any cut surfaces must be vegetated as soon as possible using local indigenous materials.
- Only local indigenous vegetation shall be used for mulching.

## **Operational Phase**

The various protective measures that were installed during the construction phase must be properly maintained. These include but are not limited to the following:-

- Vegetation of road verges and cut faces must be inspected and maintained on a regular basis. This is particularly important on steep slopes.

### **7.17 Fencing of the Construction Site**

## **Construction Phase**

- Appropriate fencing should be erected around the construction site during the construction process. The clearing of vegetation for fencing shall be limited to the removal of trees and shrubs within 1m of the fence line within the construction area.
- Where possible, the fence line must be aligned to retain indigenous trees or tree groups. There shall be no removal of grass or topsoil within this width except for rehabilitation purposes.
- Any existing fences damaged during construction activities shall be repaired immediately. The following must be adhered to with regards to fencing:
  - The Contractor shall ensure that all identified highly sensitive habitats are protected by demarcated no-go areas through fencing or other suitable means. Particularly areas of sensitive Quartzite Fynbos to avoid destroying these whilst construction takes place.
  - In areas which need fencing; the fences should have enough space between wires for small animals to move across them uninhibited.

### **7.18 Pedestrian and Traffic Safety**

#### **Construction Phase**

- As mentioned in Section 7.17 above, during construction the site shall be fenced off to prevent access.
- Fencing shall be inspected weekly and maintained properly, by the Contractor, until construction is complete.
- The Contractor shall ensure that signage, which should be pictorial and in the vernacular, is erected on all boundary fences warning against entering the construction area.
- Public awareness programmes shall be developed by the Contractor with the community to identify areas of particular risk and approaches to reduce risk.
- Traffic calming and speed control measures for access to construction sites shall be instigated in consultation with the local authorities.

### **7.19 Health Risks and Traffic generated Pollutants**

#### **Construction Phase**

- During construction all vehicles and construction machinery should be maintained to a standard that minimises pollutants.

#### **Operation Phase**

- Levels of air pollution must be regularly monitored;

### **7.20 Access Requirements**

#### **Construction Phase**

No access/haul roads other than those required for construction purposes shall be developed. As far as possible, existing roads shall be used for access/haulage purposes. All new temporary access/haul roads as approved by DEA shall also be approved by the Contractor in consultation with the ESO and ECO. Prior to the construction of new access/haul roads, topsoil shall be stripped and stockpiled as discussed under Section 7.8 above. All temporary roads no longer required shall be decommissioned and the land rehabilitated as described under Section 7.3.

#### **Operational Phase**

All access requirements must be identified and detailed by the Contractor. Communities, landowners and/or developers within the turbine site will be required to apply for access to the turbines from the Contractor. The Contractor must consider each application and consult with each applicant in this regard.

## 7.21 Landscape and Visual

- The Contractor shall ensure that construction camps are located inconspicuously in the landscape to reduce visual impact severity. This will include placing construction camps in already disturbed landscapes in close proximity to the construction area. In addition, construction camps shall be made of temporary structures that can be moved easily, and will not be placed on ridges, elevated slopes and open landscapes.
- The Contractor shall ensure that construction activities are expedited in the construction phase reducing the temporal scale thereby reducing the visual exposure time.
- The Contractor shall place construction camps, stock piles and associated activities within the construction site or on previously disturbed sites where-ever possible to reduce extensive landscape impacts that can lead to a general depletion of the overall landscape character.
- The Contractor shall ensure that construction camp establishment avoids landscape modifications like tree cutting, grading and levelling of the landscape.
- The Contractor shall write design and placement guidelines for structures and infrastructure i.e. signage, communication, lighting etc. for approval by the ECO and these must consider:
  - Use of appropriate materials;
  - Massing, i.e. cluster activities where possible;
- The Contractor shall ensure the establishment of appropriate setbacks/buffers from adjacent sensitive land uses, especially residential and tourism;
- The Contractor with the approval of the engineer shall ensure that building structure has modest scale, height and form of simple rectangular nature;
- The Contractor with the approval of the engineer shall ensure that structures to be as „transparent’ as possible to „melt’ / integrate into the landscape- make use of slender structures;
- Signage and other infrastructure, to be kept to a minimum;
- New road construction should be minimised and existing roads used where possible.
- The Contractor should maintain good housekeeping on site to avoid litter and minimise waste.
- Clearance of indigenous vegetation should be minimised and rehabilitation of cleared areas should start as soon as possible.
- Erosion risks should be assessed and minimised as erosion scarring can create areas of strong contrast which can be seen from long distances.
- Laydown areas and stockyards should be located in low visibility areas (e.g. valley between the ridges) and existing vegetation should be used to screen them from views.
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency.
- Fires and fire hazards need to be managed appropriately.
- Turbines should not be associated with power lines and similar structures and should be as far removed from them as possible.
- The power line connecting the turbine with the grid should be buried.
- Maintenance of the turbine is important. A spinning rotor is perceived as being useful. If a rotor is stationary when the wind is blowing it is seen as not fulfilling its purpose and a negative impression is created.
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.
- According to the Aviation Act, 1962, Thirteenth Amendment of the Civil Aviation Regulations, 1997: *“Wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether. If such colours are to be used, then wind turbines shall be supplemented with daytime lighting, as required.”*

- Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.
- Trees are an effective measure against shadow flicker and if residents are willing, trees can be planted to reduce flickering.

## 7.22 Accommodation of Traffic

Adequate traffic accommodation must be implemented during transportation of turbine component to the site. All relevant road traffic and other legislation must be adhered to when transporting abnormal loads to the site. The Contractor shall ensure that all construction personnel and vehicles are clearly visible. The safety of both workers on site and road users is to be ensured at all times.

## 7.23 Employment

Without compromising construction and operation activities and schedules, local labour should be employed as far as possible. Those successful in obtaining employment should be provided with the appropriate skills development and training. This is consistent with TWE's current plans.

### 7.23.1 Local Labour Recruitment and Employment Strategy

The facilitation strategy has been developed to provide a framework for the Contractor and Terra Wind Energy Haverfontein (Pty) Ltd to effectively facilitate the implementation of the Terra Wind Energy Haverfontein Project in a manner that creates opportunities for the intended beneficiaries to be actively involved in the project. The strategy to be adopted should be in line with and guided by the objectives and policies of National Government.

The social dynamics of the surrounding community should be taken into consideration in the formulation of a facilitation strategy. For example, in an area where the traditional authorities are dominant, the strategy should be to influence them to engage other community structures. This should be done in a manner that would assure them that their authority is not eroded yet the rest of the community does not feel marginalized.

The project should involve all the communities in the vicinity of the Terra Wind Energy Haverfontein Project to ensure full participation in the project. The facilitation of employment in the areas should be done in consultation with their Tribal Authorities, Ward Committees, Councillors, Municipalities and other development committees in the area.

Typically, this approach would involve the following steps:

- **Step One: Appointment of a Co-ordinating Social Facilitator**  
The Co-ordinating Social Facilitator (CSF) will be responsible for all the social components of the project, including the setting up of Project Steering Committees (PSC) and the ground rule for the rest of the other structures and systems that will be required for the project. The CSF will manage and monitor the work of the various PSCs and oversee the recruitment, appointment and training of the Community Liaison Officers (CLO).
- **Step Two: Establishment of Project Steering Committees and Labour and Employment Desks:**  
The PSC will essentially be the link between the Project Team and the Local Community. The PSC, together with the CSF and the CLO will be responsible for the development of a labour pool. It is with this labour pool where local labour will be recruited. The PSC through a labour desk will be intricately involved in the recruitment process and will monitor the performance of local labourers.
- **Step Three: Appointment of Community Liaison Officers:**  
The CLO will be on the ground and basically do the day-to-day and week-to-week monitoring of labour in conjunction with the site agent and the Contractor. Both the PSC and the CLO will be responsible, answerable and accountable to the CSF.



## **8 CONCLUSION**

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Terra Wind Energy Haverfontein Project as detailed in the EIR and specialist reports. The EMPr could thus change daily, and if managed correctly lead to a successful construction and operational phases.

Further guidance should also taken for any conditions contained in the Environmental Authorisation, if the project is granted approval, and that these DEA conditions must be incorporated into the final EMPr.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

# ANNEXURE A PROFORMA: PROTECTION OF THE ENVIRONMENT

## To be signed by Contractors

**PRO FORMA**

Employer \_\_\_\_\_  
Contract No \_\_\_\_\_  
Contract title \_\_\_\_\_

**PROTECTION OF THE ENVIRONMENT**

The Contractor will not be given right of access to the site until this form has been signed.

I/ we \_\_\_\_\_ (Contractor) record as follows:

1. I/ we, the undersigned, do hereby declare that I/ we am/ are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.
2. In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I/ we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in so far as I/ we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options. In this regard, I/ we recognise and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.
3. I/ we acknowledge and accept the right of \_\_\_\_\_ to deduct, should they so wish, from any amounts due to me/us, such amounts (hereinafter referred to as fines) as the Resident Engineer and Environmental Site Officer shall certify as being warranted in view of my/ our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:
  - 3.1 The Resident Engineer and Environmental Officer, in determining the amount of such fine, shall take into account *inter alia*, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to eliminate/reduce future occurrences.
  - 3.2 The Resident Engineer and Environmental Officer shall, with respect to any fine imposed, provide me/ us with a written statement giving details of the offence, the facts on which the Resident Engineer and Environmental Officer has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed \_\_\_\_\_  
CONTRACTOR

Date \_\_\_\_\_

## ANNEXURE B PROPOSED ENVIRONMENTAL EDUCATION COURSE

### WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe
- Buildings, cars and 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. construction could stop 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 site boundaries at all times



## RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the 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 without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission



## 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 where instructed



## DUST

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



## NOISE

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



## TOILETS

- Use the toilets provided
- Report full or leaking toilets



## 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



## EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- Ambulance:
- Fire:
- Police:



## FINES AND PENALTIES

- Spot fines of between

To be confirmed by Engineer

- Your company may be fined
- Removal from site
- Construction may be stopped



## PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!



**ANNEXURE C  
ENVIRONMENTAL COMPLAINTS REGISTER**

ENVIRONMENTAL COMPLAINTS REGISTER							
<b>CONTRACT TITLE:</b>							
<b>CONTRACT NUMBER:</b>							
DATE	COMPLAINT	COMPLAINT MADE BY (Include Contact Details)	ACTION REQUIRED	RESPONSIBLE PERSON	ACTION IMPLEMENTED	DATE ACTION IMPLEMENTED	CHECKED BY ECO

**ANNEXURE D  
ENVIRONMENTAL INCIDENTS REGISTER**

ENVIRONMENTAL INCIDENTS REGISTER							
<b>CONTRACT TITLE:</b>							
<b>CONTRACT NUMBER:</b>							
DATE	INCIDENT (What, where, how, possible impacts)	REPORTED BY	ACTION REQUIRED	RESPONSIBLE PERSON	ACTION IMPLEMENTED	DATE ACTION IMPLEMENTED	CHECKED BY ECO

**APPENDIX E: IFC PERFORMANCE STANDARDS CHECK LIST**

Requirements	Currently covered	Required	Reporting Requirements/How Addressed	Where Addressed		Responsibility
<b>PS 1: Social &amp; Environmental Assessment and Management System</b>				<i>Report Volume</i>	<i>Section in Report</i>	
<b>1. Establish and maintain an SEMS</b>	No	Yes	Develop SEMS manual with links to key system documents	EMPr/SEMS		CES/Terra Power
<b>2. Conduct social and environmental assessment to international standards</b>	Yes	Yes	Determine what the required scope must be - baseline study depth and duration of assessment	EIR		CES
2.1. Updated project description	Yes	Yes	Duly Performed - however, will be revised between ESR and EIA phase as preliminary turbine placement informed by specialist study and more finite detail on supporting infrastructure (associated facilities) is made available in preliminary design phase	ESR and EIR	EIR: Chpt 2	CES
2.2. Credible S&E baseline studies	Yes	Yes	Avifauna/Bat/Social etc baseline studies - depth, extent and duration baseline studies - SB expectations and applicable IFC requirements needs to be confirmed	EIR/EMPr/SEMS	Specialist Report: Vol 3.; EMPr: Chpt 7; EIR: Chpters 8 & 9	CES/Specialists
2.3. Identification of relevant S&E impacts (PS 2-8)	Yes	Yes	Duly Performed	ESR and EIR	EIR: Chpt 3.4, 4 & 9; Appendix D	CES
2.4. Identification of I&APs and vulnerable groups	Yes	Yes				
2.5. Assess impacts of associated facilities e.g. power lines	Yes	Yes	Duly Performed	EIR	EIR : Chpters 8 & 9	
2.6. Assessment of cumulative impacts	Yes	Yes				
2.7. Assessment of indirect impacts	Yes	Yes				
2.8. Assessment of transboundary impacts	N/A	N/A	N/A	N/A		N/A
2.9. Objective (external) evaluation of impacts	No	Yes	Peer review process - internal (SA) or external (international)?	EIR phase		Peer Reviewer
2.10. Assessment of feasible alternatives	Yes	Yes	Other than incremental (locational) alternatives this will not be addressed due to the nature of the project i.e. fundamental (activity) type alternatives will not be assessed	EIR	EIR: Chpt 6; EMPr: Chpt 4	CES
<b>3. Compliance with legislation (national &amp; international)</b>	Yes	Yes	Develop legal update procedure in Safety, Health, Environmental and Community (SHEC) manual	EIR and EMPr/provide legal register	Vol.1 FSR: Chpt 3	CES/Terra Power
<b>4. Establish mitigation and performance improvement programme</b>	Partial	Yes	Comprehensive mitigation and performance monitoring programmes to be developed as part of EMPr	EMPr	Chpt 5.2 and 5.6: Requires further development by the applicant and the contractor	CES/Terra Power
4.1. Develop mitigation measures	Yes	Yes	Need to develop mitigation measures for significant aspects/impacts	EIR and EMPr	EIR: Chpt 8; EMPr:	CES/Terra Power
4.2. Develop Aspects Register	No	Yes	Aspects Register to be developed by Terra Power once detail design is available. Confirm that Aspects Register includes community risks	EMPr	Chpt 3.4 - Requires further development by the project applicant	CES/Terra Power
4.3. Set measurable objectives and targets	No	Yes	Develop Objectives and Targets as part of management plans. These must be in line with SA legislative and IFC requirements.	EMPr	Chpt 4.1.2 - To be developed further by the project proponent	CES/Terra Power
4.4. Develop and implement EMPrs	Partial	Yes	Check requirements of EMPr and expand if necessary	EMPr	Chpt 4 - To be developed further by the project proponent	CES
4.5. Develop policies and programmes to prevent impacts	Partial	Yes	Develop management programme and plans	EMPr	Chpt 4 - To be developed further by the project proponent	CES/Terra Power

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4.6. Develop and implement Standard Operating Procedures (Sops) for key risk activities	No	Yes	Conduct GAP analysis and developed remaining SOPs	EMPr	To be developed further by the project proponent	CES/Terra Power
4.7. Feedback loop between monitoring and actions	No	Yes	Develop and describe environmental monitoring procedures that include environmental and social indicators. Develop link between audits / monitoring and follow-up actions	EMPr	To be developed further by the project proponent	CES/Terra Power
4.8. Develop timeframes for implementation	No	Yes	Develop timeframes as part of the management plans	EIR and EMPr	To be developed further by the project proponent	CES/Terra Power
4.9. Must communicate action plans to I&APs	Partial	Yes	Once EMPrs and timeline completed, disclose to I&APs	EIR and EMPr	On completion of EIR and timelines need to be developed further by the project proponent	CES
4.10. Develop schedule and mechanism for external reporting	Partial	Yes	Describe mechanism in the SHEC manual	EMPr		CES
<b>5. Develop organizational structure and roles and responsibilities</b>	<b>Yes</b>	<b>Yes</b>	Develop and describe roles and responsibilities	EMPr	To be developed further by the project proponent	CES/Terra Power
5.1. Develop organizational structure that defines roles & responsibilities	Partial	Yes	<b>Develop organogram &amp; action plan to address shortfalls</b>	EMPr	To be developed further by the project proponent	CES/Terra Power
5.2. Develop plan to strengthen organisational structure as required	Partial	Yes	Identify weaknesses and develop plans to address	EMPr	To be developed further by the project proponent	CES/Terra Power
<b>6. Training</b>	<b>Partial</b>	<b>Yes</b>	Undertake training needs analysis	EMPr		CES/Terra Power
6.1. Training needs analysis	Partial	Yes	Undertake training needs analysis after completing SHEC manual, SOPs and EMPrs	EMPr		CES/Terra Power
6.2. Develop training material	Partial	Yes	Must review existing training material and fill gaps	EMPr	Annexure B; To be developed further by the project proponent	CES/Terra Power
6.3. Develop detailed training schedule for all levels of employees	No	Yes	Must develop detailed training schedule for all employees	EMPr	To be developed further by the project proponent and contractors	CES/Terra Power
6.3. Undertake training	No	Yes	To be initiated after completion of training material	EMPr	To be conducted by EHSO	CES/Terra Power
<b>7. Community Engagement &amp; Disclosure</b>	<b>Partial</b>	<b>Yes</b>	Full IFC requirements to be adhered to	EIR and EMPr		CES/Terra Power
7.1. Disclose project information to affected communities	Yes	Yes	Duly Performed	EIR and EMPr	To be conducted by Applicant and appointed CLO	CES/Terra Power
7.2. Develop formal procedure for disclosure of info to local communities	Yes	Yes	Confirm whether this is in place and obtain copy. If not available, develop formal procedure for SHEC manual	EIR and EMPr	To be developed and conducted by Applicant and appointed CLO	CES
7.3. Establish records of community disclosure / consultation	Yes	Yes	Confirm whether these exist and link to SHEC manual	EIR and EMPr	Vol.1 FSR	CES/Terra Power
7.4. Establish a grievance mechanism	Partial	Yes	Confirm with Terra Power site managers and Environmental Control Officers (ECO's) - and link to SHEC manual	EIR and EMPr - no SEP requirements but need to outline project lifespan community engagement strategy in CEMPr	To be developed further by the project proponent	CES/Terra Power
<b>8. Develop system to monitor performance of management system</b>	<b>No</b>	<b>Yes</b>	These procedures must be incorporated into the SHEC Manual	EIR and EMPr		CES
8.1. Develop procedures for monitoring & measure effectiveness of system	No	Yes	Key performance indicators to be developed as part of management plans	EIR and EMPr	To be developed further by the project proponent	Terra Power

**Environmental Management Plan – Annexures**

8.2. Record information to track performance	No	Yes	In place for water quality but needs to be developed for all areas	EMPr	To be developed further by the project proponent	Terra Power
8.3. Include inspections and audits by external experts	No	Yes	Develop procedures for internal and external audits of all SHEC monitoring data	EMPr	Chpt 7; To be developed further by the project proponent	CES/Terra Power
<b>9. Reporting</b>	<b>No</b>	<b>Yes</b>	Procedure to be developed for SHEC manual	EMPr	To be developed further by the project proponent	CES/Terra Power
9.1. Develop procedure for Action Plan internal reporting to senior management	No	Yes	Procedure to be developed for SHEC manual	EMPr	To be developed further by the project proponent	CES/Terra Power
9.2. Develop procedure for Action Plan external reporting to SB/senior management	No	Yes	Procedure to be developed for SHEC manual	EMPr	To be developed further by the project proponent	CES/Terra Power
9.3. Reporting to communities on action plans and mitigation measures	No	Yes	Procedure to be developed for SHEC manual	EMPr	To be developed and conducted by Applicant and appointed CLO	CES/Terra Power

**PS 2: Labour and Working Conditions**

<b>1. Working conditions and management of worker relationship</b>	<b>No</b>	<b>Yes</b>	To be developed in its entirety			Terra Power
1.1. Adopt a human resources policy setting out approach to managing employees	No	Yes	Terra Power/ Contractor HR and link to SHEC Manual	SHEC Manual	To be developed by the project proponent	Terra Power
1.2. The HR policy will be explained or made accessible to each employee upon taking employment	No	Yes				Terra Power
1.3. Working conditions and terms of employment will be communicated to all directly contracted employees and workers	No	Yes				Terra Power
1.4. Collective bargaining agreements will be respected	No	Yes				Terra Power
1.5. Where no collective bargaining agreement, working conditions and terms of employment must, at a minimum, comply with national law	No	Yes				Terra Power
1.6. In countries where workers' organizations are permitted, national law will be complied with. Where not permitted by law, alternative means for workers to express grievances and protect rights regarding working conditions and terms of employment must be provided.	No	Yes				Terra Power
1.7. Employment decisions will not be made on the basis of personal characteristics unrelated to job requirements	No	Yes				Terra Power
1.8. The employment relationship will be based on the principle of equal opportunity and fair treatment	No	Yes				Terra Power
1.9. National employment legislation will be adhered to	No	Yes				Terra Power
1.10. A plan to mitigate the adverse impacts of retrenchment on employees will be developed if layoff of a significant number of employees expected	No	Yes				Terra Power
1.11. A grievance mechanism for workers to raise reasonable concerns will be provided.	No	Yes				Terra Power
1.12. Workers will be informed of the grievance mechanism at the time of hiring and it will be made available to them	No	Yes				Terra Power
<b>2. Protecting the workforce</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>		<b>N/A</b>
2.1. Children will not be employed in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or development	N/A	N/A	N/A	N/A		N/A
2.2. Where national laws have provisions for the employment of minors, these laws will be adhered to	N/A	N/A	N/A	N/A		N/A
2.3. Children younger than 18 years will not be employed in dangerous work	N/A	N/A	N/A	N/A		N/A
2.4. No forced labour of any kind will be employed	N/A	N/A	N/A	N/A		N/A
<b>3. Occupational health and safety</b>	<b>No</b>	<b>Yes</b>	To be developed in its entirety			Terra Power
3.1. Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards.	No	Yes	Terra Power/Contractor EHS line function	SHEC Manual	To be developed by the project proponent	Terra Power
3.2. Steps will be taken to prevent accidents, injury and disease arising from, associated with, or occurring in the course of work by minimizing the cause of hazards.	No	Yes				Terra Power
3.3. Hazards to workers will be identified	No	Yes				Terra Power
3.4. Preventative and protective measures will be provided	No	Yes				Terra Power
<b>4. Non-employee workers</b>	<b>No</b>	<b>Yes</b>				Terra Power
4.1. Commercially reasonable efforts will be used to apply the requirements of this PS to non-employee workers	No	Yes	Terra Power/Contractor HR/Project Management line			Terra Power

**Environmental Management Plan – Annexures**

4.2. With respect to contractors or other intermediaries procuring non-employee workers, commercially reasonable efforts will be used to confirm that contractors or intermediaries are reputable and legitimate and require that they apply the conditions of this PS.	No	Yes	function			Terra Power
<b>5. Supply chain</b>	N/A	N/A	N/A	N/A		N/A
5.1. The adverse impacts associated with supply chains will be considered where low labour cost is a factor in the competitiveness of an item supplied.	N/A	N/A	N/A	N/A		N/A
5.2. It will be necessary to inquire about and address child labour and forced labour in the supply chain.	N/A	N/A	N/A	N/A		N/A

**PS 3: Pollution Prevention & Abatement**

<b>1. General requirements</b>	Partial	Yes	To be included in EIR revisions/requirements	EIR/EMPr/SEMS/IWMP/SHEC Manual		CES/Terra Power
1.1. Employ appropriate technologies to avoid or minimise pollution	Partial	Yes	Prepare list of pollution sources from the Aspects Register and identify mitigation measures are in place or need to be put in place	EMPr/SEMS	Chpt 7; To be developed by the project proponent	CES/Terra Power
1.2. Examination of resource conservation and energy efficiency measures	Partial	Yes	Based on outcome of Aspects Register, set objectives and targets to reduce use of resources and energy	EMPr/SEMS	To be developed by the project proponent	CES/Terra Power
1.3. Must adhere to national or EHS standards (whichever is more stringent)	No	Yes	Confirm compliance to national and/or IFC EHS guidelines and standards	EMPr/SEMS		CES/Terra Power
<b>2. Waste</b>	Partial	Yes	Develop Integrated Waste Management Plan (IWMP)	IWMP		CES/Terra Power
2.1. Avoid or minimise waste production	Partial	Yes	Ensure that this is included in the EHS policy and IWMP	IWMP	To be developed by the project proponent	CES/Terra Power
2.2. Must reuse and recover wastes where possible	Partial	Yes	Ensure that this is included in the EHS policy - Consider opportunities as part of the IWMP	IWMP	To be developed by the project proponent	CES/Terra Power
2.3. Disposal of waste in environmentally sound manner	Partial	Yes	Ensure that this is included in the EHS policy and IWMP	IWMP	To be developed by the project proponent	CES/Terra Power
2.4. Explore commercially reasonable alternatives for hazardous waste disposal	Partial	Yes	Ensure that this is included in the EHS policy - Consider opportunities as part of the IWMP	IWMP	To be developed by the project proponent	CES/Terra Power
2.5. Make use of reputable and legitimate waste contractors	Yes	Yes	Develop selection criteria for waste disposal contractor -Confirm identity of waste disposal operator and safe disposal certification system	IWMP/SHEC Manual	To be developed by the project proponent	CES/Terra Power
<b>3. Hazardous materials</b>	N/A	N/A	N/A	N/A		N/A
3.1. Avoid, minimise or control release of hazardous materials	N/A	N/A	N/A	N/A		N/A
3.2. Avoid manufacture, trade and use of banned chemicals	N/A	N/A	N/A	N/A		N/A
<b>4. Emergency preparedness and response</b>	No	Yes	Develop detailed emergency response procedures and link to the SHEC Manual - Develop and implement training for emergency response for all employees	SHEC Manual		CES/Terra Power
4.1. Develop and implement emergency response plan	No	Yes		SHEC Manual	To be developed by the project proponent	CES/Terra Power
<b>5. Ambient Concentrations</b>	N/A	N/A	N/A	N/A		N/A
5.1. Must consider assimilative capacity of the environment and land use	N/A	N/A	N/A	N/A		N/A
<b>6. Greenhouse gas emissions</b>	Yes	Yes	Duly Performed	ESR and EIR		CES
6.1. Must promote reduction of GHG emissions	Yes	Yes	Ensure that this is addressed in the EHS Policy for incidental emissions - not required for overall project	EIR and EHS Policy	EIR: Chpt 10; To be developed by the project proponent	CES/Terra Power
6.2. Establish whether annual CO <sub>2</sub> equivalent emissions > 100 000 tons	N/A	N/A	N/A	N/A		N/A
6.3. Annual quantification and monitoring of GHG emissions	N/A	N/A	N/A	N/A		N/A
6.4. Evaluate feasible options to reduce or offset GHG emissions	N/A	N/A	N/A	N/A		N/A
<b>7. Pesticide use and management</b>	N/A	N/A	N/A	N/A		N/A
7.1. Develop and implement an integrated pest / vector management approach	N/A	N/A	N/A	N/A		N/A
7.2. Avoid use of banned pesticides	N/A	N/A	N/A	N/A		N/A

**PS 4: Community Health, Safety & Security**

**Environmental Management Plan – Annexures**

<b>1. General</b>	<b>Partial</b>	<b>Yes</b>				
1.1. Must evaluate risks to health and safety of affected communities	Partial	Yes	Make sure that risks to the community are included in the H&S risk register. Make sure that mitigation measures to minimise risks to the community are available and linked to the SHEC Manual. Confirm whether H&S risks have been communicated to the local communities and that a procedure is included in the SHEC Manual	EIR/EMPr/SHEC Manual	EIR: Chpt 9; To be developed by the project proponent	CES/Terra Power
1.2. Preventative measures must be established	Partial	Yes				
1.3. Action plans and other relevant information must be communicated to affected communities and authorities on an ongoing basis	No	Yes				
<b>2. Infrastructure and equipment safety</b>	<b>Partial</b>	<b>Yes</b>				
2.1. Construct and operate facility in line with good international industry practice	Partial	Yes	Define and link to SHEC Manual	SHEC Manual - specifications binding in terms of overall project contracting	EMPr: Appendices A & B; To be developed by the project proponent	SB/Terra Power/Contractor
2.2. Qualified experts to review final design	No	Yes	Confirm that external experts have reviewed final design	External review post EIR	To be developed by the project proponent	SB/Terra Power
2.3. Must seek to prevent incidents with vehicles / equipment on public roads	Yes	Yes	Make reference to procedures for reducing incidents on public roads (link to SHEC Manual)	SHEC Manual	To be developed by the project proponent	Terra Power/Contractor
<b>3. Hazardous materials safety</b>	<b>Partial</b>	<b>Yes</b>				
3.1. Prevent exposure of community to hazardous chemicals	Partial	Yes	Develop map of site showing location of hazardous chemicals / substances and develop document listing measures to prevent contact by communities. This will form part of the Hazardous Chemicals Management Plan & IWMP. Develop security and safe transport procedure and link to the SHEC Manual	SHEC Manual	To be developed by the project proponent	CES/Terra Power/Contractor
3.2. Where exposure is possible, special care must be exercised						
3.3. Must exercise reasonable efforts to control the safety of deliveries of hazardous materials and transport and disposal of wastes						
3.4. Avoid or control community exposure to pesticides	N/A	N/A	N/A	N/A		N/A
<b>4. Environmental and natural resource issues</b>	<b>Partial</b>					
4.1. Avoid or minimise exacerbation of impacts caused by natural hazards	Partial	Yes	Create link to the Disaster Management Plan in the SHEC Manual	SHEC Manual	To be developed by the project proponent	CES/Terra Power/Contractor
			Ensure that EHS has assessed the risk of flooding and landslides			
4.2. Avoid or minimise adverse impacts due to project activities on soil, water and other natural resources in use by affected communities	Partial	Yes	Create links in the SHEC Manual to the Hazardous Chemical Management Plan, IWMP			
<b>5. Community exposure to disease</b>	<b>Yes</b>	<b>Yes</b>				
5.1. Prevent or minimise potential exposure of community to diseases that could result from project activities	Yes	Yes	HIV education programmes linked to SHEC Manual and on site induction training. Develop procedure documenting measures to reduce spread of communicable diseases			Terra Power/Contractor
5.2. Prevent or minimize transmission of communicable disease that may be associated with the influx of temp or permanent project labour	Yes	Yes				
<b>6. Emergency preparedness and response</b>	<b>Partial</b>	<b>Yes</b>				
6.1. Must evaluate risks to health and safety of affected communities	Partial	Yes	Create link to the Disaster Management Plan in the SHEC Manual			
6.2. Preventative measures must be established	Partial	Yes				
6.3. Document emergency response procedures, activities, resources and responsibilities	Partial	Yes				
6.3. Action plans and other relevant information must be communicated to affected communities and authorities on an ongoing basis	No	Yes				
<b>7. Security personnel requirements</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>		<b>N/A</b>
7.1. Assess risks to those in and outside project site posed by security arrangements	N/A	N/A	N/A	N/A		N/A
7.2. Apply good international practice and applicable law (hiring, equipping, rules of conduct, training)	N/A	N/A	N/A	N/A		N/A
7.3. Grievance mechanism enables communities to express concerns about security arrangements	N/A	N/A	N/A	N/A		N/A
7.4. Must investigate any credible allegations of unlawful or abusive acts of security personnel and take action to prevent recurrence	N/A	N/A	N/A	N/A		N/A

**PS 5: Land Acquisition & Involuntary Resettlement**

Not applicable to the Terra Power projects

**PS 6: Biodiversity Conservation & Sustainable Natural Resource Management**

1. Protection and conservation of biodiversity	Yes	Yes		EIR/EMPr/ASMP	EIR: Chptrs 8 and 9	CES/Terra Power/Contractor
1.1. Assess impacts to biodiversity, focusing on major threats	Yes	Yes	Duly Performed - refer to PS 6: 9 - 10	EIR/EMPr		
1.2. In modified habitats, minimize conversion or degradation and identify opportunities to enhance habitat and protect biodiversity	Yes	Yes				
1.3. Conversion or degradation of natural habitat to be avoided unless no feasible alternatives, benefits > costs and appropriate mitigation undertaken	Yes	Yes				
1.4. Mitigation will be designed to achieve no net loss of biodiversity where feasible	Yes	Yes				
1.5. No project activities in critical habitats unless stringent conditions met	Yes	Yes				
1.6. Adhere to conditions if development in legally protected area	Yes	Yes				
1.7. No intentional introduction of new alien species unless within regulatory framework	Yes	Yes				
1.8. No deliberate introduction of any alien species with a high risk of invasive behaviour	Yes	Yes	Develop and Alien Species Management Plan (ASMP) to tie in with general rehabilitation and revegetation management actions	EMPr/ASMP		
1.9. Due diligence exercised to prevent accidental or unintended introductions of aliens	No	Yes	Alien Species Management Plan should be developed to monitor and prevent unintended introduction of aliens.	EMPr/ASMP		
<b>2. Management and use of renewable natural resources</b>	Partial	Yes				
2.1. Renewable resources will be managed sustainably	Partial	Yes	Incorporate in over all SEMs and EMPrs	EIR/EMPr/ASMP		

**PS 7: Indigenous Peoples**

Not applicable to the Terra Power projects

**PS 8: Cultural Heritage**

1. Internationally recognized practices	Yes	Yes			EIR: Chptrs 8 and 9	CES/Terra Power/Contractor
1.1. Comply with national and international law on protection of cultural heritage	Yes	Yes	Duly performed			
1.2. Must protect and support cultural heritage (include field-based study)	Yes	Yes	Duly performed	Heritage and palaeontological studies -EIR		
1.3. Avoid damage to cultural heritage	Yes	Yes	Incorporate with chance finds procedure	EMPr/SHC Manual - Cultural Heritage Mangement Plan		
<b>2. Chance find procedures</b>	Yes	Yes				
2.1. 'Chance Find' procedures must be developed and implemented	Yes	Yes	Develop chance find procedure			
<b>3. Consultation</b>	Yes	Yes				
3.1. Must consult with affected communities about cultural heritage	Yes	Yes	By specialist during fieldwork			
<b>4. Removal of cultural heritage</b>	Yes	Yes				
4.1. Must adhere to conditions before moving cultural heritage	Yes	Yes	Develop procedure for moving cultural heritage/SAHRA permitting - however will not be necessary			
<b>5. Critical cultural heritage</b>	Yes	Yes				
5.1. No critical cultural heritage will be damaged	Yes	Yes	Confirm no critical cultural heritage in project area	EIR/EMPr/SHC Manual		
<b>6. Projects use of cultural heritage</b>	N/A	N/A	N/A	N/A		N/A

**IFC Wind Energy EHS Guidelines**

1. Visual impacts	Yes	Yes			EIR: Chptrs 8 and 9	CES/Terra Power/Contractor
Consult the community on the location of the wind farm to incorporate community values into design;	Partial	Yes	Community input is limited - mostly landowners themselves	EIR/EMPr		
Consider the landscape character during turbine siting;	Yes	Yes	Duly Performed			
Consider the visual impacts of the turbines from all relevant viewing angles when considering locations;	Yes	Yes				
Minimize presence of ancillary structures on the site by avoiding fencing, minimizing roads, burying intraproject power lines, and removing inoperative turbines	Yes	Yes				
Avoid steep slopes, implement erosion measures, and promptly revegetate cleared land with native species only;	Yes	Yes				
Maintain uniform size and design of turbines (e.g. direction of rotation, type of turbine and tower, and height);	Yes	Yes				

**Environmental Management Plan – Annexures**

Paint the turbines a uniform colour, typically matching the sky (light grey or pale blue), while observing marine and air navigational marking regulations;	Yes	Yes				
Avoid including lettering, company insignia, advertising, or graphics on the turbines.	Yes	Yes				
<b>2. Noise</b>	Yes	Yes				
Proper siting of wind farms to avoid locations in close proximity to sensitive noise receptors (e.g. residences, hospitals, and schools);	Yes	Yes				CES/Terra Power/Contractor
Adherence to national or international acoustic design standards for wind turbines (e.g. International Energy Agency, International Electrotechnical Commission [IEC] and the American National Standards Institute).	Yes	Yes	Duly Performed		EIR/EMPr	
<b>3. Species mortality or injury and disturbance</b>	Yes	Yes				
Conduct site selection to account for known migration pathways or areas where birds and bats are highly concentrated.	Yes	Yes	Duly Performed		EIR/EMPr	
Configure turbine arrays to avoid potential avian mortality.	Yes	Yes				
Implement appropriate stormwater management measures to avoid creating attractions such as small ponds which can attract birds and bats for feeding or nesting	Partial	Yes	Will require further development		EIR/EMPr	
<b>4. Light and illumination issues</b>	Yes	Yes				
Site and orient wind turbines so as to avoid residences located within the narrow bands, generally southwest and southeast of the turbines, where shadow flicker has a high southeast of the turbines, where shadow flicker has a high frequency	Yes	Yes	Duly Performed		EIR/EMPr	
Paint the wind turbine tower with non-reflective coating to avoid reflections from towers.	Yes	Yes				
<b>5. Habitat alteration</b>	As Above	As Above				EIR: Chpters 8, 9 & 10
<b>6. Water quality</b>	As Above	As Above				
<b>A. Occupational Health and Safety</b>	As Above	As Above				
<b>B. Community Health and Safety</b>	As Above	As Above				
<b>C. Performance Indicators and Monitoring</b>	Partial	Yes				
Environmental monitoring activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable	Partial	Yes	Will need to be revised for emissions and applicability		EIR/EMPr/SHEC Manual	
Bird and bat injury and mortality, dead bird searches – involving entire carcasses, partial remains, and feathers	Yes	Yes	Duly Performed		EIR/EMPr/SHEC Manual	
Noise impacts should not exceed the levels presented in the General EHS Guidelines, nor result in a maximum increase in background levels of 3 dB at the nearest receptor location.	Yes	Yes	To be incorporated in acoustic assessments by specialist		EIR/Acoustic study	